

A treatise on nasal suppuration : or suupurative diseases of the nose and its accessory sinuses / by Ludwig Grünwald.

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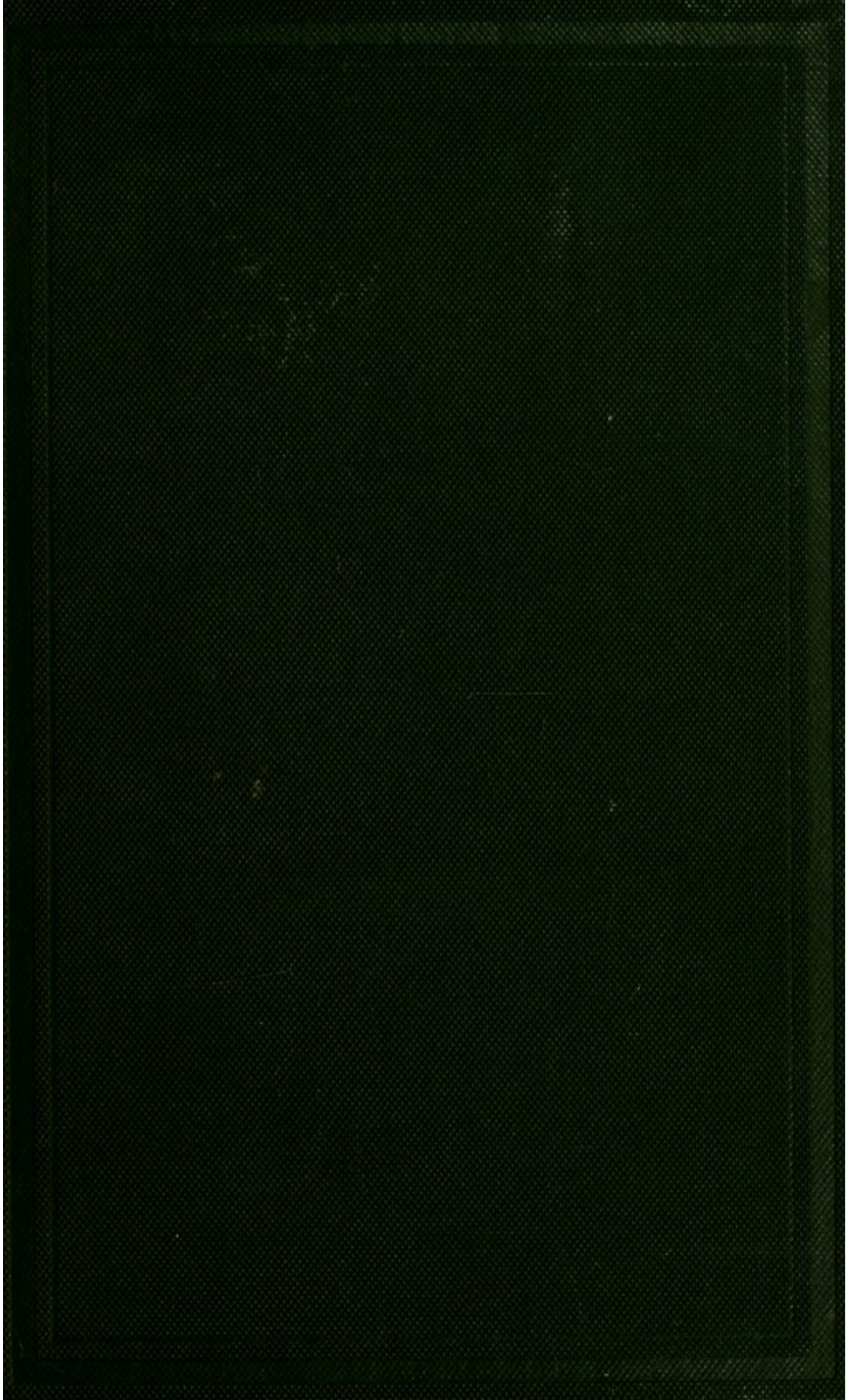
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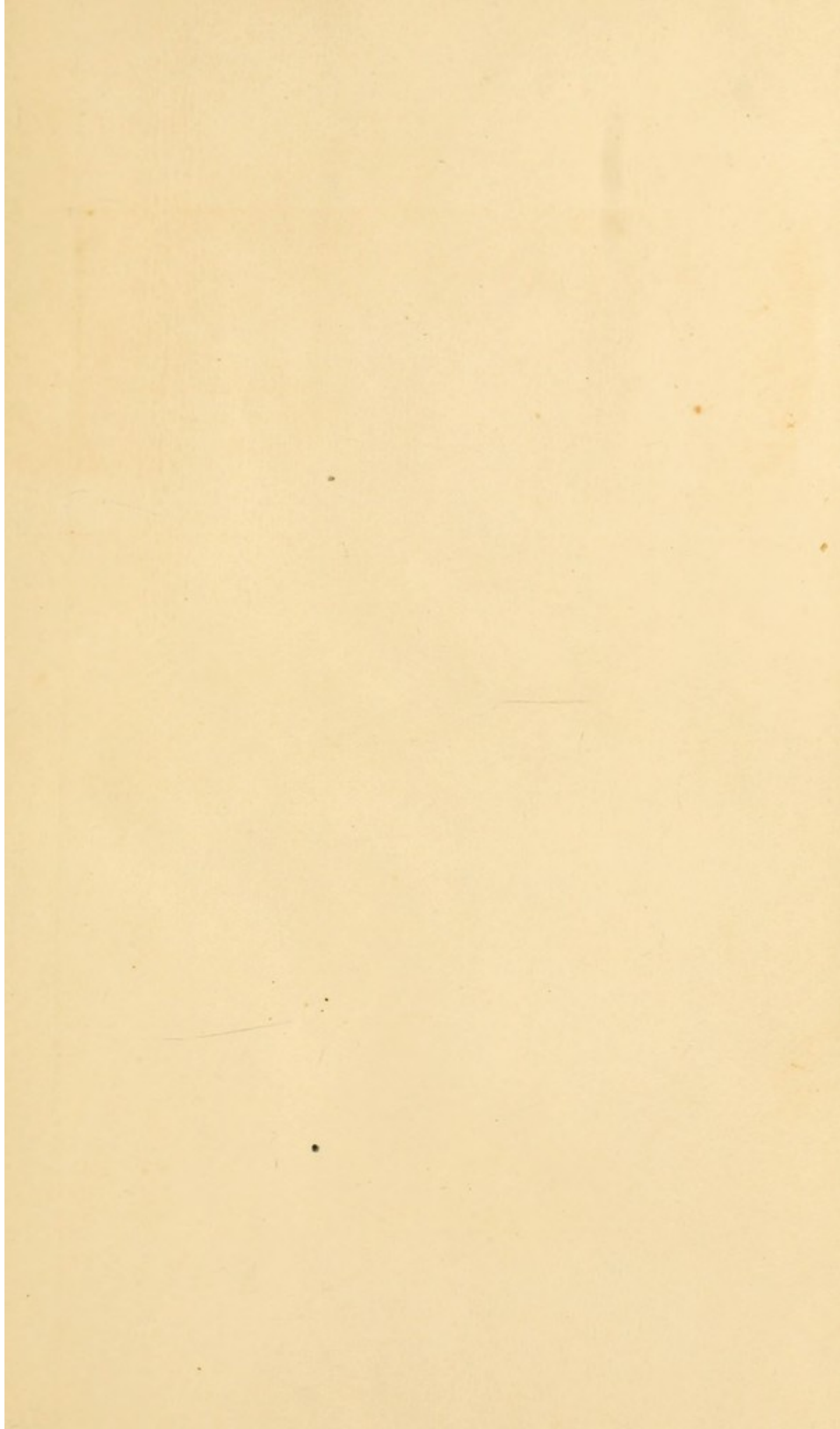
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A TREATISE
ON NASAL SUPPURATION

A TREATISE ON
NASAL SUPPURATION;

OR,

Suppurative Diseases of the Nose and its
Accessory Sinuses.

BY

DR. LUDWIG GRÜNWARD
(OF MUNICH).

Translated from the Second German Edition

BY

WILLIAM LAMB, M.D., M.C. EDIN., M.R.C.P. LOND.
(OF BIRMINGHAM).

*WITH EIGHT ILLUSTRATIONS IN THE TEXT,
TWO PLATES, AND ONE TABLE.*

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WILLIAM WOOD & COMPANY.

1900.

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TRANSLATOR'S PREFACE.

THE suppurative diseases of the nose and its accessory sinuses have of late years attracted much attention amongst rhinologists, and the belief is gaining ground that these affections are much more frequent than has generally been supposed.

Probably no one man has had more to do with this change of view than Dr. Grünwald, and his book, which embodies the results of many years' work and an exceptionally large experience, is well known and highly esteemed in Germany and elsewhere.

The English translation requires no apology by way of introduction, for there is no book in our language which deals with the subject in any detail. The translator has endeavoured to convey the author's meaning in as few words as possible consistent with clearness.

A good many readers will perhaps dissent more or less widely from Dr. Grünwald's views on the genesis of polypi and on 'ozæna'; but most will probably admit that there is a great deal of truth in what he says, and will find that this, the most contentious part of the book, is at the same time the most stimulating and suggestive.

No one who remembers the very slow and gradual translation into practice of knowledge regarding post-nasal adenoid growths will feel surprised at the tardy recognition of nasal suppurations. The accessory sinuses can only be subjected to direct scrutiny by operative procedures which are only justified by reasonable certainty in diagnosis, and the symptoms are in many cases so misleading that the disease not unfrequently lasts for years before a diagnosis is arrived at.

Headache—dull, or 'nervous,' or 'neuralgic'—and in-

capacity for mental work, may be the sufferer's only complaint; often he has 'phlegm in the throat,' or comes with the ready-made diagnosis of 'post-nasal catarrh.'

Again, he may complain of a 'sore throat,' which shows perhaps very little obvious change, and may be diagnosed as 'paræsthesia'; or loss of voice may bring him to the surgeon, with distinct and suggestive changes in the larynx, pointing upwards to the real source of the disease.

Nasal obstruction, from polypi, hypertrophies, or turbinal engorgement, and the group of symptoms called 'ozæna,' especially the unilateral variety, are examples of other conditions which are liable to mask the presence of nasal suppuration and lead to errors in diagnosis. Whether they do so as frequently as Dr. Grünwald believes, the translator is unable from his own more limited experience to say, but that such mistakes do occur, not so very rarely, he is quite certain.

Enough has been said to show that the physician, or the surgeon, or the general practitioner, is almost as likely to be consulted by a patient suffering from nasal suppuration as the specialist, and it is therefore desirable that every practitioner should have his interest awakened in the subject sufficiently to make him think of it as a possibility when suspicious cases come before him.

It is one of the great merits of Dr. Grünwald's book that it has aroused interest and stimulated inquiry.

The translator takes this opportunity of acknowledging his indebtedness to Dr. Grünwald, Herr Lehmann (his publisher), and Herr Stiefenhofer, for the use of the blocks of the various illustrations.

22, TEMPLE ROW, BIRMINGHAM,

January, 1900.

PREFACE TO THE SECOND GERMAN EDITION.

THE first edition of this little book met with a kinder reception than I ventured to hope for, and the issue of a second edition affords me a welcome opportunity of filling certain obvious gaps.

The experience, personal and otherwise, that has been accumulated since the issue of the first edition, has been so considerable as to enable me to revise and rearrange the whole of the contents in a systematic form.

I have, however, retained the fundamental idea of the connection existing between all nasal suppurations. They are considered to be the organic expression (varying anatomically) of the reaction of the upper air-passages to infective agents.

I had thought of limiting my work to the accessory cavities alone, and of including the non-inflammatory diseases to which they are subject, but after full consideration I rejected this plan as involving an artificial division of the subject.

The necessity of careful search for localized foci of disease as being generally at the root of the trouble has been even more strongly impressed upon me since the appearance of the first edition, and from this follows, as a matter of course, the supreme importance of local treatment.

Many specialist colleagues who were formerly opposed to this view have now adopted it, and it is perhaps not too much to hope that it will soon be generally recognised and carried to its logical conclusion in practice.

In deference to suggestions from various readers, I have in this edition discussed the relation of tubercle and syphilis to nasal suppuration. This was all the more necessary in the

case of the latter disease, as there seemed to be some danger of confusion on several points.

With regard to literature, I have adhered to the principle of referring only to such contributions as were necessary for my readers.

My critics have shown me, that on several questions, conclusions which seemed to me self-evident were not so regarded, but stood in need of more thorough discussion. For this I owe them thanks. I would, however, remind them that whilst an author must be prepared to accept criticism, favourable or otherwise, with equanimity, he *has* some ground of complaint when views are attributed to him which he never held, and sayings to which he never gave utterance. Considering the mass of contemporary literature, I am perhaps asking too much, but nevertheless I would venture to beg my critics to read me attentively. 'An den Referaten sollt ihr ihn erkennen.'

For the rest, I hope it may be as evident to the readers of this edition as it has been to myself in practice, that there has been real progress both in pathology and therapeutics—a sifting of the chaff from the grain. With regard to diagnosis, I trust that the new observations and improved methods which have been incorporated with this edition may be found of use, for accurate diagnosis is the foundation of successful treatment; and as regards treatment, I venture to hope that some of the methods of procedure will be found to be simpler and more efficient.

That the observations and clinical histories recorded in this book should help to place the pathological anatomy of these diseases upon a solid foundation, in agreement with the recognised laws of pathology, has at least been my desire.

In this direction, new material of some importance has been added to the second edition.

LUDWIG GRÜN WALD.

PREFACE TO THE FIRST GERMAN EDITION.

THE subject of nasal suppurations has not yet been treated in detail by any author.

I was induced to attempt the task by the conviction that the importance of purulent nasal discharge as a symptom is very far from being appreciated by the public, and that this indifference is to some extent shared by the profession. Yet it is a symptom which is common to very various conditions, some quite trivial, and others threatening life.

In addition, it was my object to show that this symptom in the great majority of cases depends upon local (or circumscribed) disease, which, as a rule, requires surgical treatment for its cure.

Indiscriminate douching has been far too much employed in nasal diseases, more especially in the suppurative cases, which might often be quickly cured by some comparatively slight surgical operation.

On the other hand, it must be acknowledged that there is such a thing as excessive surgical zeal, and of this there is at least a suspicion in the practice of some specialists.

This extreme is best avoided by carefully investigating all the points which may throw light upon the nature of the local process and its relation to the general condition, rejecting vague and ambiguous ætiological terms, such as 'dyscrasia' and 'diathesis.'

In this direction, too, I hope my book may be of use, by showing—what some at least among us have still to learn—that a 'dyscrasia' is very often not the cause, but the consequence, of diseases of which the chief or only symptom is a purulent nasal discharge.

Many of the facts I have adduced are well known, though I have sometimes introduced them in a new connection. For this reason I have to a great extent refrained from quoting authorities and their views, except in the case of new or doubtful subjects. This will explain some apparent omissions.

In other cases, again, I have been obliged to give very full details of the literature, as statistics are only now being accumulated. This is true of the chapters on sphenoidal and ethmoidal disease. It was my experience of this latter class of cases which first led me to publish my results, and finally to extend my work so as to include the whole field of nasal suppurations.

Seeing that I have relied chiefly upon personal experience as being the only sure foundation for conclusions upon any subject, it will be readily understood that my work lays no claim to the character of a systematic text-book. I have thus been able, with a good conscience, to omit many of the better-known facts, for even personal experience on a worked-out subject becomes tedious.

If I succeed in reflecting the most important aspects of our varying daily practice, and in inciting some of my readers to successful work in this limited, but most important, field, my object will be attained.

In conclusion, let me say that I have purposely omitted the description of the specific processes (syphilis, tubercle, glanders, leprosy), as being beyond the scope of my work, and this must be particularly borne in mind in considering my statistics and the recorded results of other authors.

LUDWIG GRÜN WALD.

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A TREATISE
ON
NASAL SUPPURATION.

DIFFUSE NASAL SUPPURATION.

To Ziem belongs the credit of having shown that a large proportion of cases of nasal suppuration are due to localized diseases, more especially of the accessory sinuses. Unfortunately, the idea still prevails that general purulent rhinitis is quite a frequent condition, whilst localized disease, especially bone disease, is rare ; and to this idea, fostered by a misleading nomenclature, must be attributed many errors in diagnosis between the two forms of nasal suppuration. It is the function of the specialist to distinguish as sharply as possible, with what success he may, between these two processes.

The occurrence of diffuse purulent rhinitis must be granted, but, on the other hand, I cannot too strongly insist upon the fact that since I have been in the habit of systematically examining these cases I have not, in adults, encountered a single one in which localized disease could be excluded ; and, on the other hand, I have succeeded in establishing the existence of localized disease in a number of cases which had been diagnosed as purulent rhinitis. Even in children it is extremely rare to find chronic diffuse purulent rhinitis. When it does occur, it is generally as a sequela of acute infectious diseases, especially diphtheria, in connection with which I have several times observed it. As the result of gonorrhœal

infection it occurs but very rarely, and in hereditary syphilis localized foci of disease are nearly always to be found.

The real proportion of general to local suppurations in the nose appears from Harke's report, in which only three cases of general suppurative rhinitis are recorded: two in connection with erysipelas and diphtheria, whilst the nature of the third was undetermined.

More convincing still, however, than any theoretical considerations will be found a careful and systematic examination of individual cases. In pursuing this investigation, one must constantly bear in mind the fact that those parts of the nasal cavity which are accessible to rhinoscopy are merely to be considered as the common duct or outlet of a number of cavities which are often separately diseased; and a diagnosis of independent disease of the mucous membrane of this common duct is never justified till the smallest of the accessory cavities have been with certainty excluded.

The great rarity and comparative unimportance of general nasal suppuration, as compared with localized, justifies the briefness of this notice.

LOCALIZED SUPPURATIONS.

PART I.—GENERAL.

A. *ÆTIOLOGY.*

ACUTE empyemata frequently arise in connection with a so-called 'cold in the head,' or form, rather, its concluding stage. Whether this connection is due to specially virulent infection, or to catarrhal swelling of the mucous membrane causing retention of secretion in the accessory cavities, it is often hard to say. Primary nasal infection thus accounts for a certain number of cases, but, as I have already indicated in previous papers, empyemata are also specially liable to occur as part of a general infection, *i.e.*, complicating certain acute infectious diseases. That this is specially true of children's diseases, the records of Harke's⁽¹⁾ post-mortem examinations show. In thirty cases of croup, diphtheria, measles, whooping-cough, scarlatina and chicken-pox, not one was free from suppuration in the accessory nasal cavities, the antrum being most frequently affected. In adults the same thing occurs, but the localization is more variable. Some of the recorded cases are pretty old. In 1853 Zuccarini⁽²⁾ found empyema of the antrum in three cases of erysipelas occurring as a complication in the course of typhoid fever. Weichselbaum⁽³⁾, in examining the bodies of sixteen persons who had died of influenza, found chiefly suppuration of the antrum and frontal sinus; while Siebenmann⁽⁴⁾, in three cases of typhoid and several of influenza, found, post-mortem, sphenoidal empyema.

Ewald⁽⁵⁾ recorded a case of meningitis in a surgeon due to influenzal empyema of both antra and of the ethmoidal cells.

Amongst Harke's thirty-seven autopsies of adults, in cases of typhoid, pneumonia, influenza, erysipelas and meningitis, nasal suppuration was found no less than thirty-two times; thirty-one times in the accessory cavities. This of course does not prove the causal connection with acute infectious disease in every case; some of the cases no doubt dated further back.

Clinical observation confirms the above results.

Amongst twenty-nine cases of empyema of the antrum observed by Siebenmann⁽⁴⁾, eight set in on the first day, of which number five were due to influenza, one to pneumonia, and one to acute bronchitis. In the eighth case the causal connection with influenza was doubtful.

Jeaffreson⁽⁶⁾ observed ethmoidal empyema twice in connection with scarlet fever; and Flatau⁽⁷⁾ recorded the occurrence of empyema of the antrum and ethmoidal cells as a consequence of measles. Most of the acute cases which come under observation are in connection with influenza, for those due to other infectious diseases are either latent and undergo spontaneous cure, or else they are not recognised till they become chronic. The influenzal cases, however, sometimes set in from the very first with such severe symptoms that they, as it were, compel the surgeon to recognise them. I have been obliged to open the antrum during the acute stage, so severe were the symptoms.

Flatau⁽⁷⁾ records two cases, one of left antral empyema, the other of bilateral ethmoidal, which arose in connection with acute facial erysipelas, chronic suppuration having been previously excluded.

Finally, acute suppuration arises by extension of infection from neighbouring organs, and by traumatic infection.

To the first group belong acute dental empyemata of the antrum. They rarely, it is true, come under observation at this stage, yet I have seen two cases.

Further, I have seen acute suppuration in the lower meatus, due to infection from a carious bicuspid tooth, and cured by extraction of the tooth. Acute traumatic infection most frequently affects the frontal sinus. Numerous cases have been

recorded; the earliest I can find was in 1693. Lamzweerde⁽⁸⁾ recorded a case due to the kick of a horse. In 1725 Pineau⁽⁹⁾, a surgeon in Melun, observed a case in a boy of 12, also due to the kick of a horse. The anterior walls of both frontal sinuses were driven in. General subcutaneous emphysema appeared in the course of the case, and recovery was complete in three months. A similar case, due to a blow, was recorded by Maréchal⁽¹⁰⁾ in 1754; and Haller⁽¹¹⁾ observed a case in which a spindle penetrated the sinus.

In more recent times Dörner⁽¹²⁾, Bouyer⁽¹³⁾, Mason Warren⁽¹⁴⁾, Godlee⁽¹⁵⁾, Bull⁽¹⁶⁾, Gabszewicz⁽¹⁷⁾ and Montaz⁽¹⁸⁾ have recorded cases.

The antrum is also liable to acute traumatic infection. Bordenave⁽¹⁹⁾ recorded three cases in 1784: in one case a nail was shot in; in another case a fragment of a shell; and in a third a tooth was driven in. Fouchard⁽²⁰⁾ also mentions a case in which a tooth was driven in. But traumatic empyema of the antrum must be extremely rare, for the next observation is by König⁽²¹⁾, in whose case a knife-blade lay for forty-two years in the antrum, giving rise to intermittent discharge of pus. Next comes a case of my own. A man was kicked in the face by a horse, and the antrum was opened in the canine fossa above the second molar. Lately Bauer⁽²²⁾ observed a similar occurrence in a child of 3, from a fall against a chest of drawers, and Scheier⁽²³⁾ reports the lodgment of a revolver-bullet in the antrum with secondary suppuration.

As regards traumatic empyema of the sphenoidal sinus, a case reported by Betz⁽²²⁾ was probably of this nature, and due to the entrance of a straw. The ethmoidal cells may also be affected, as in a case of Oppenheimer's⁽²⁴⁾, in which a patient shot himself with a revolver above the bridge of the nose. After twelve years of fœtid suppuration the bullet was extracted from the middle meatus.

Chronic nasal suppuration is either the sequel of the acute, or arises gradually from long-continued irritation. In the former case the ætiology is of course the same as that of the acute forms, as may be learned from the history, but in chronic cases patients have often forgotten all about the beginning of their trouble.

Many of my patients referred their illness quite definitely to a bad cold in the head; others ascribed it (bilateral ethmoidal empyema) quite as positively to an attack of pneumonia. Typhoid was the probable cause in a case of left antral and bilateral ethmoidal and sphenoidal empyema, whilst two other cases (circumscribed suppuration with caries, and bilateral ethmoidal and sphenoidal empyema) were referred with some probability to diphtheria and scarlet fever respectively. The probability was pretty strong in the latter case, for the patient was a surgeon, and remembered when he was $3\frac{1}{2}$ having scarlet fever, followed by chronic otorrhœa on both sides. 'I cannot exactly say when the snuffles began,' he says; 'one or two years after the scarlet fever I had it very much as I have now.'

Influenza is frequently assigned as a cause. Two patients ascribed the origin of their empyema to head injury, received during military service; the one man had a fall from his horse, the other was severely cuffed by his drill-instructor. Such statements must, of course, be taken for what they are worth. Amongst traumatic cases may be included two of nasal tuberculosis, in which the disease spread from the lower turbinal to the outer wall, opening into and infecting the antrum.

Amongst cases due to accidental injury must be included those acute inflammations set up by operations on neighbouring organs. Langenbeck⁽²⁵⁾ had two cases of acute empyema of the antrum in connection with the operation for resection of the second division of the fifth. Jourdain⁽²⁶⁾, Schütz⁽²⁷⁾, Jeanty⁽²⁸⁾, and Siebenmann⁽²⁹⁾ had a similar experience after tooth extraction. The same thing occurred apparently in one of my own cases; three months after the extraction of a first molar tooth by a dentist, an empyema of the antrum appeared, which presently discharged through the empty socket. This mode of infection may also occur without surgical interference, as in a case observed by Spitzer⁽³⁰⁾, in which a tooth grew into the antrum.

The conveyance of infective pus from one cavity to others in the course of operative treatment comes under the head of traumatism, and also cases like those recorded by Hartmann⁽³²⁾

and Siebenmann⁽³¹⁾, in which empyema of the antrum was set up by the application of wadding dipped in perchloride of iron to the interior of the nose. That the larvæ of various flies and worms may get into the accessory cavities (preferably the antrum and frontal sinus), and set up empyema, is well known; and Harke's⁽¹⁾ observations prove that vomited matters from the stomach may also occasionally obtain access, and act in the same way.

Direct infection by erysipelas I observed once, in a case of double ethmoidal empyema. The patient, a woman, had, seven months previously, an attack of erysipelas, which, beginning in the back of the head, crept forwards, invading the eyes, and finally the nose. Ever since that time there had been profuse suppuration.

In another case, facial erysipelas and relapsing empyema of the antrum alternated several times, so that one could not say which was the primary affection; and what was specially interesting, at least in the later attacks, the erysipelas spread directly from the antrum through the bones and soft parts of the cheek to the skin. The case is fully reported farther on. Recently, in a mother and daughter, I observed several relapses of erysipelas in connection with chronic empyema, and the circumstances were such as to make it extremely probable that the cocci of erysipelas were the cause of the empyema.

Luc⁽³⁴⁾ found streptococci in one case of erysipelalous inflammation of the antrum, thus completing the bacteriological proof as one would *a priori* expect to find it. Amongst forty-three cases of empyema of the ethmoid, sphenoid and frontal sinus, Schäffer⁽³⁵⁾ observed five times the occurrence of erysipelas, or of erysipelalous conditions of the face; and Zuccarini⁽²⁾, Weichselbaum⁽³⁶⁾, Zuckerkandl⁽³⁷⁾, Ziem⁽³⁸⁾, Killian⁽³⁹⁾, Harke⁽¹⁾, and Flatau⁽⁷⁾, all record the occurrence of erysipelas in empyema. Schuster⁽⁴⁰⁾ also mentions a case of sphenoidal empyema that set in simultaneously with facial erysipelas.

It is very probable in all these cases that the streptococcus infection has not been secondary, but rather is to be considered the primary cause both of the empyema and of the relapses; otherwise it would be difficult to understand why erysipelas does not occur simultaneously with most empyemas, as the

conditions for mixed infection are extremely favourable, owing to the presence of erosions and cracks at the entrance of the nostrils. Betbèze's⁽⁴¹⁾ case of frontal empyema, which arose in connection with rheumatic fever, and gave rise to several attacks of facial erysipelas, was probably also due to streptococcus infection. The question now arises, Why do these affections, beginning acutely, become chronic?

No doubt many cases of acute purulent catarrh of the accessory cavities undergo spontaneous cure, and it is often difficult or impossible to decide what the unfavourable conditions are which determine chronicity. It may be that the initial inflammation is so violent as to cause destruction of soft parts, or even of bone, but, judging from our present anatomical and clinical experience, this is extremely rare. Much more frequently cure is delayed or rendered impossible by unfavourable anatomical conditions, which prevent sufficient drainage of the products of inflammation. Thus in almost all of the accessory sinuses, the natural opening is not at the lowest point of the cavity, and—more important still—the natural opening is very liable to be occluded by swelling of the surrounding mucous membrane. The influence of the erectile tissues in the nose must be kept in mind. They often remain in a condition of reflex congestion after the inflammatory swelling of the mucous membrane has disappeared. Specially injurious is the presence of 'adenoids.' On the one hand they cause stagnation of pus; and on the other hand, by altering the direction of the respiratory air-stream, they cause pus to be conveyed to other regions of the nose, as in the acts of blowing the nose or sneezing.

Cases of suppuration which are chronic from the beginning depend essentially upon two sets of causes. Firstly, frequently repeated inflammatory irritation of the mucous membrane of various kinds (repeated catarrhs, tobacco, alcohol, dust, especially chemically irritating dust) tends on the one hand to increase secretion, and on the other hand to induce swellings which favour retention and decomposition of secretion at certain points, so that finally, in consequence of prolonged irritation, suppuration becomes established in such regions.

In my experience suppuration arising in this way only occurs in the nasal passages proper (the common duct, as I have called it) and in the naso-pharynx—in the latter situation generally in connection with adenoid vegetations. The second cause of chronic suppuration is continuous infection from a neighbouring organ already diseased. The most frequent source of this sort is suppuration of the pharyngeal tonsil, for it runs a very chronic course, and provides always a ready supply of infective material.

Next in frequency as a source of infection come the teeth, disease of which was till lately regarded as the only cause of empyema of the antrum. The increasing frequency with which the teeth have been found perfectly sound in such cases disposes of this exclusive view, which, indeed, ought never to have been accepted, for it was obvious that other causes must be operative, seeing that empyema is not limited to the antrum, but occurs in other cavities which have no conceivable connection with teeth. Killian (³⁹) also insists upon this.

In ninety-eight cases of antral empyema, I could in fifty-nine find no connection with teeth, seeing that they were absolutely sound. In fourteen cases caries of the crown was present, but the roots were sound, and in four of the fourteen, other more distant accessory cavities, which had certainly nothing to do with teeth, were diseased as well as the antrum. Only fourteen times could I certainly trace the origin of the empyema to disease of the teeth, either by direct observation or from the patient's history; and in eleven cases the question was doubtful. Thus, although two-thirds of my cases were not caused by diseases of the teeth, yet it is very important not to overlook even the slighter forms of these diseases in connection with antral suppuration. I would especially emphasize the fact that a tooth must not be considered harmless in this respect because the socket is not diseased. Infection creeps along the lymphatics of healthy bone, and a focus of infection in the crown of a tooth is by no means to be despised; for even if an empyema of the antrum be due to another cause, yet disease of the crown of a tooth is calculated to maintain such a state of irritation in the mucous membrane as may frustrate all attempts at cure.

That foci of suppuration in the interior of the nose may infect other parts of the cavities is readily conceivable, and has been proved by the observations of Macdonald⁽⁴²⁾, Killian⁽³⁹⁾, and myself⁽⁴³⁾. The upper cavities may infect the lower; empyema of the frontal sinus may drain into the antrum, and the same thing may happen with ethmoidal suppuration. Further, I have a strong impression, derived from careful study of the history of various cases, that incomplete operations sometimes cause a similar extension of disease; reactionary swelling and the use of plugs forcing the pus into healthy cavities. Polypus operations are especially to blame in this respect, for they are often undertaken in ignorance of the existence of empyema, and so without the least reference to it.

The origin of empyemata of the accessory cavities by extension of inflammation from the mucous membrane of the turbinals is not the general rule. On anatomical grounds, and finding that rhinitis and empyema were frequently present together, Zuckerkandl assumed that the rhinitis caused the empyema. I have only seen one case in which this was the probable sequence of events.

The reverse order of things, empyema followed by rhinitis, is, of course, very well known clinically. It is important to know what are the really demonstrable ætiological factors in chronic suppuration, and especially in chronic empyema, for most of them continue to exert their evil influence after the disease is established, and their removal is therefore an essential part of treatment.

The relation of the different foci to the various ætiological factors described above will be fully considered later.

B. MORBID ANATOMY.

A CONSIDERABLE number of anatomical data are available, gleaned partly from post-mortem examinations, and partly from living patients. The various observers, however, differ widely, both as to the facts themselves and as to the interpretation of them. It is evident that a comprehensive and accurate view cannot be founded upon the experience of any one observer, however large that may be, but must take account of the results of other authors. This consideration has been overlooked by several writers, and it is therefore all the more important, by a comparison of various observations, to try and estimate their true significance.

How widely the results differ is evident from the following: In thirty-three dissections of inflammatory diseases of the accessory sinuses Zuckerkandl⁽⁴⁴⁾ found cysts of the mucous membrane of the antrum eleven times amongst thirty-seven antra in which the mucous membrane was diseased.* This corresponds roughly to 30 per cent.; whereas Harke, in examining 198 such diseased cavities, only observed cysts four times, *i.e.*, 2 per cent.

Heyfelder⁽⁴⁵⁾ found cysts only sixteen times in 456 cases of disease of the upper jaw (3.5 per cent.). Heymann⁽⁴⁶⁾ examined 500 cavities, and observed cysts nineteen times; but these figures can hardly be used for purposes of comparison, for the former author does not give the proportion of diseased cavities as compared with other affections of the upper jaw, and the latter does not give the number of cavities diseased in other ways.

The reports upon the occurrence of polypi in the sinuses also

* It is not quite clear from Zuckerkandl's report whether the conditions described in Cases 5, 6, 8, and 23 refer to one or both antra. I have reckoned the lesions as bilateral, and including five cases of cyst formation.

differ widely. Luschka, in sixty dissections, 'said he found polypus of the antrum five times,' as Zuckerkandl⁽⁴⁷⁾ puts it; Zuckerkandl himself in 300 dissections observed only three cases of typical mucous polypus of this cavity. Heymann⁽⁴⁶⁾ reported fourteen cases in 250 examinations; Harke in more than 400 post-mortems observed only four. I myself in examining seventy-six antra (sixty-six in the living and ten in the dead), all freely exposed, found polypoid degeneration of the mucous membrane on two occasions. If we arrange these figures in a tabular form, we have :

Luschka	...	120 cavities	5 polypi	=	4.15 per cent.
Zuckerkandl	...	600 ,,	3 ,,	=	.5 ,, ,,
Heymann	...	500 ,,	14 ,,	=	2.8 ,, ,,
Harke	...	326 ,,	4 ,,	=	1.2 ,, ,,
The Author	...	76 ,,	2 ,,	=	2.63 ,, ,,
Heyfelder	...	456 upper jaws	7 ,,	=	1.75 ,, ,,

We shall discuss presently the causes of these differences.

While Harke, in adult bodies, found that not less than 50 per cent. had morbid conditions of the antrum, Gradenigo⁽⁴⁸⁾ in 103 bodies found only nineteen such cases, *i.e.*, 18 per cent.

Equally surprising are the results as regards the relative frequency of ethmoidal disease as given by Schäffer and the author, and confirmed by Killian⁽⁴⁹⁾, Bresgen⁽⁵⁰⁾, and Baumgarten⁽⁵¹⁾, compared with the fact that Zuckerkandl recorded only three cases of ethmoidal suppuration in thirty-three dissections (= 9 per cent.), and Harke fourteen cases in 145 dissections (= 9.6 per cent.).

Again, Harke found no bone disease in his cases of empyema, and the changes he described in the mucous membrane were comparatively uniform; whereas Zuckerkandl described a great variety of changes in the mucous membrane, and, along with progressive plastic periostitis, also a few cases of destructive disease of bone. Finally, in clinical reports we often find descriptions of caries, and of malignant and extensive destructive processes (frequently confirmed by post-mortem examination), processes of which the anatomist as yet has no knowledge. These striking differences may be explained to a great extent by differences in the material. Harke's dissections relate to 101 adults and 62 children; Zuckerkandl's observations seem

to have been made entirely upon adults. Every experienced rhinologist knows that this would account for a good deal.

The greater severity of the diseases observed in patients, both during life and post-mortem, is due to the fact that while anatomical dissections are made upon what may be called purely chance material, clinical observations are made on patients whose sufferings have, at any rate, been severe enough to drive them to the surgeon. No doubt the nature of the affection is not always recognised, but yet it is safe to say that such material must contain a much higher percentage of severe affections than the unselected chance cases that fall to the anatomist. The fact that neither Zuckerkandl, nor Heymann, nor Harke, in all their dissections, came across a single case of sarcoma or carcinoma, exemplifies this difference very well.

It would, of course, be absurd to deny the truth of all facts observed clinically, because they had not been confirmed by the results of anatomical dissection, or in so far as they differed from the results of such dissection; and it is just as absurd to deny the frequent occurrence of *limited* bone disease, because only *extensive* bone destruction has been found post-mortem in cases of empyema. Naturally, the lesser lesion must precede the greater. Yet this has actually happened. The blind zeal of one particular author has carried him so far as to maintain that caries of the ethmoid, the antrum, or the other bones of the framework of the nose, is always due either to syphilis or tubercle. It might suffice to reply in the pertinent words of Wilkin⁽⁵²⁾: 'Why should this bone differ from others in the body in being unaffected by prolonged periostitis?' The observations of Zuckerkandl, mentioned above, supply a sufficient answer to the author in question, and to all who, through lack of knowledge and experience, have been misled by the positiveness of his statement. However, in order finally to dispose of the question (which, indeed, only exists for those who are innocent of all knowledge of morbid anatomy), I must make a few remarks on general pathology, entreating the indulgence of those of my readers to whom the whole thing is a matter of course.

In the first place, it must be observed that the word 'caries' is nowadays much abused in being applied by surgeons exclu-

sively to tuberculous inflammations of bone. As a matter of fact, caries denotes any kind of ulceration of bone, and this is the sense in which it is used by pathologists. 'Caries is a kind of progressive inflammation of bone, resembling ulcerative processes of the soft parts. One distinguishes a simple and a fungous caries' (Villaret's Dictionary, vol. ii., p. 112).

'Pressure, inflammation, and tumour growth cause, as a rule, only local bone destruction. When little superficial microscopic defects result, one speaks of bone erosion, but if larger areas are destroyed, or at least much changed and rarefied, the term "caries" is applied' (Ziegler, 'Path. Anat.', vol. ii., 2, p. 846, 1885). 'A frequent result (of rarefying osteitis) is finally caries and necrosis.'

'Suppurative periostitis is a frequent cause of necrosis (interference with nutrition from the side of the periosteum, extension of inflammation to the Haversian canals.)'

'The characteristic thing about caries is the progressive ulcerative destruction of the substance of the bone' (Birsch-Hirschfeld, 'Path. Anat. Handbook,' vol. ii., pp. 15, 20, 23).

To prevent any confusion with the tuberculous fungous disease of bone, I will quote another sentence from the last-named author. He says: 'Caries fungosa may be regarded as an intensification of rarefying osteitis.'

Finally, a few lines from Billroth and Winiwarter's 'General Surgical Pathology and Therapeutics' (edn. 1883, p. 600 *et seq.*), which proves that Zuckerkandl's observations and mine on disease of the antrum are not contradictory, but complementary.

Zuckerkandl⁽⁵³⁾ says: 'The inner wall of the antrum was generally rough; not, however, for the reasons assigned by Grünwald, but, on the contrary, as the result of osteophytic periostitis.'

The following quotation, however, from the standard work on Surgical Pathology, already quoted, will show that osteophytes and caries, so far from being incompatible, are really different stages of one and the same process:

'Osteophytes are the results of inflammatory irritation of the periosteum and surface of the bone. . . . According to Billroth, almost every chronic periostitis is at first osteoplastic. All other modes of termination originate sooner or later from

this. It is much more frequent for the bone to become affected, even if only superficially—that is to say, for an ostitis to be added to a periostitis; and this ostitis is not an ossifying ostitis, but a chronic, suppurative, ulcerative ostitis—a superficial caries, in fact.'

So much for general pathological considerations, and to clear one's conceptions. The following quotation shows the special appositeness of these considerations to this unduly vexed question:

'In empyema of the antrum the dilatation is less, yet there is often caries of the bony wall, and this caries is in other cases the primary lesion' (Birsch-Hirschfeld, *loc. cit.*, p. 358).

'Caries frequently attacks the upper jaw . . . sometimes in consequence of empyema of the antrum' (Heyfelder, p. 512).

That ulceration of bone should result from purely suppurative processes in the antrum need not surprise us if we bear in mind, as Zuckerkandl points out, the analogy existing between suppuration in the antrum and in the middle ear. Zuckerkandl⁽⁵⁴⁾ says: 'On comparing the structure of the mucous membrane of the antrum with that of other mucous membranes, one finds that it resembles more closely the conjunctiva and the mucous membrane of the tympanum than any others. This analogy comes out in inflammatory conditions.' Zuckerkandl quotes Politzer's⁽⁵⁵⁾ observations in morbid anatomy, but does not give his description of the condition of the bones. I will take the liberty of supplying this omission. Politzer writes:

'The modes of termination of otitis media suppurativa are . . . 4. The suppuration leads to destruction of tissue, to ulceration and wasting of the mucous membrane, the ulceration sometimes extending to the bone.'

Thus, the contradictions between clinical and anatomical observations are to a great extent explained. In drawing conclusions from anatomical facts, it must always be borne in mind that there are more things in heaven and earth than are revealed to chance observations, however extensive, and that, in spite of the apparently large number of dissections, that number is not by a long way large enough to justify one in drawing negative conclusions, even if they were supported by

a much greater wealth of material and pathological knowledge than is at present the case.

The positive results of dissections, properly reported and explained, are of course of the highest permanent value. Negative results, on the contrary, are only specially valuable when they refer to cases which have been under observation during life.

Clinical reports confirmed by post-mortem examination are the most important of all. Unfortunately, opportunities are limited in this direction from the very nature of things. Nevertheless we possess a few such records.

The fact that bone disease is much more frequently observed in the living than it is found post-mortem, is thus to a considerable extent explained; but this consideration must not be accepted too readily, and ought to make us not less, but more careful in describing and interpreting clinical conditions. Some clinical observations there are which can be made with all the ease and certainty of autopsies, *e.g.*, in freely exposed cavities such as the antrum and the frontal sinus. Much more questionable, it must be admitted, are lesions situated in cavities or recesses which cannot be submitted to direct scrutiny. Nevertheless, since the first observations on such conditions were published by Schäffer, Moldenhauer, Schech, and the author, such a mass of confirmatory evidence has been accumulated, that even the most sceptical must take serious thought before rejecting it.

I refer more particularly to caries, or, to be perfectly accurate, to superficial ulceration of bone.

For the sake of beginners, I may mention that the signs of this condition are the presence of pus and the feeling of rough softened bone; *i.e.*, the probe conveys the impression of a hard resistant surface, presenting here and there little inequalities as the point is moved to and fro; but the resistant surface yields to slight pressure, and the point sinks in. The firmer and more resistant inequalities of bone are due either to periosteal thickenings or osteophytic growths.

Various other conditions may be confounded with diseased bone, viz. :

1. Bone covered by a very thin mucous membrane, which

is attached much more closely in some places than in others. (Such areas are found especially inside the concavity of the middle turbinal.)

2. Hollows occupied by firmly-attached crusts.

3. Very thin and brittle bone, breaking on slight pressure, such as is frequently found in the ethmoidal cells and the turbinals.

4. Bony areas denuded by operations.

5. Foreign bodies.

6. Bare bone touched by some part of the probe outside the area which is being examined.

No doubt there are other possibilities of error for a careless and inexperienced observer; in fact, it is impossible to conceive of all the mistakes which such a one might make.

The sources of error mentioned above may be guarded against by examining before, instead of after operations (as one of course generally does); and if this is impossible, as in the case of the antrum, by taking care not to touch the edges of the opening through which the probe is introduced.

This caution is the result of experience. I have seen disease of the inner wall simulated by the probe, introduced through an alveolar opening, rubbing against the edges of that opening and the adjacent rough teeth.

I can hardly suppose that anyone would be so foolish as first to remove polypi, and then mistake the exposed point of attachment for carious bone. Careful and thorough cleansing of the nose (not with the syringe or douche, still, alas! too popular, but with forceps and wadding) will enable one to exclude errors arising from foreign bodies and crusts.

Careful and repeated examinations will enable one to distinguish the inequalities due to foldings of the mucous membrane (in the situations mentioned above) from bare bone. The inequalities are very smooth in the former case.

Brittle normal bones are smooth on the surface, and crackle under pressure.

Bone denuded of its mucous membrane presents a smooth surface with equal resistance, and is thus distinguished from bone which is already eroded. The former condition I have repeatedly encountered in the recesses of the nasal cavity,

especially on the posterior wall of the sphenoidal sinus, and I take this opportunity of mentioning its distinctive characters. On tapping with the probe on such a surface, one feels the hardness of the contact and hears the clear tapping sound, whereas the presence of mucous membrane, however thin, muffles this sound till it is almost inaudible. When the parts are within view, as I have several times had them in the case of open or exposed ethmoidal or sphenoidal cells, one finds that the bone which is covered by mucous membrane presents a gray dullish lustre (the normal appearance of the thin mucous membrane of the accessory cavities), while the bare bone has a yellowish-white shining appearance. It is interesting to confirm one's diagnosis, as one may sometimes do, by observing the denuded area become gradually covered with little red islands of granulation tissue, each with its shining reflection, and finally watch the fusion of the islands and the formation of the grayish-yellow scar, as epithelial cells grow over the surface.

It is unnecessary to prescribe more rules to a cautious observer, but I may here repeat a caution which I have elsewhere⁽⁵⁶⁾ given, and which is applicable to all sources of error.

‘Only a very delicate and highly-educated sense of touch, assisted by the presence of certain negative signs, can protect from error, and that not invariably.’ Thus, the possibility of error must always be kept in mind, especially in cases of limited erosion of bone; but that is a very different thing from throwing doubt upon all observations which have not been confirmed by autopsy. Unfortunately, the possibility of anatomical, and especially of microscopical, control is rare; for just the most frequent of the superficial ulcerations of bone occur in situations where they cannot be removed *in toto* by operation. On the turbinals they are less frequent. Nevertheless, I have several times removed middle turbinals showing those superficial ulcerations of bone which I have described as ethmoidal caries. The diagnosis was made clinically before operation, and the parts were removed wide of the disease. After decalcifying the specimen in HCl, horizontal sections were prepared. The microscopical examination (I will give details

presently) confirmed in every particular the clinical diagnosis. There was extensive ulceration of the mucous membrane, and on the exposed bone 'superficial granulating and rarefying osteitis with loss of substance.' This anatomical diagnosis was confirmed by Professor Bollinger in preparations taken from two cases, and he added that the process was a superficial caries similar to that occurring on the tibia in deep ulcers of the leg. This meets Weil's⁽⁵⁷⁾ very natural request for histological examinations in caries of the ethmoid.

Before concluding this chapter I should like to indicate a weak spot in our present interpretations of nasal pathology.

The majority of rhinologists have made so few original observations in pathology, in comparison with the mass of published anatomical material, that many of them attach a quite exaggerated importance to the dicta of the anatomists, and thus, as it were, provoke, or at least encourage the latter to utter opinions, not only on anatomical conditions, but also on morbid processes, which cannot be properly judged of from an anatomical standpoint.

Take ozæna for instance. Dissection of cases has repeatedly shown disease of the accessory cavities. Now, as it does not fit in with the theory of essential or genuine atrophy that these cavities should have been primarily diseased, the anatomist imagines to himself the extension of the mystic atrophic process to the accessory cavities, and assigns to the changes found in these cavities merely an accidental and secondary value. This hypothesis is straightway vaunted as an anatomical proof, but the truth is, that in the cases of combined ozæna and empyema which have as yet been dissected, no single anatomical fact has come to light to show which was the primary process—the atrophic rhinitis or the empyema.

So again with polypi. Where empyemata and polypi occur together, no anatomist has ever yet proved which was the primary condition, but that does not prevent them from simply ignoring the clinical facts, which in many cases prove a definite chronological sequence of events in regard to both affections.

This overvaluing of anatomical results is at any rate more excusable than the positive maintenance by an anatomist, on

anatomical grounds, of opinions which can be disproved by quotations from his own writings (as I shall show presently); and the habit of simply ignoring the results of earlier workers in so far as they are not in accordance with present-day views. Let me give an example of the latter method. According to Zuckerkandl (³⁷, p. 300), it is 'inconceivable that closure of the antrum, persisting for a considerable time, should not produce a condition of reaction in the mucous membrane of that cavity.' Then, without the support of a single original observation, he paints a picture of how the thing must look. But the famous anatomist Meckel observed a case in which the antrum, was closed on both sides, and the mucous membrane of the cavities normal. This contradictory evidence Zuckerkandl sets aside with the remark: 'This description of Meckel's appears to be due to inaccurate observation'! One appreciates the position still more on learning that Stromeyer (⁵⁸) observed complete closure of the frontal sinus by a tumour, and that the sinus contained no secretion; and, farther, that Engelmann, since Stromeyer's time, has described a preparation in the Freyburg collection, in which, in spite of complete adhesion of the opening of the frontal sinus, the cavity was quite empty.

If a post-mortem examination by an anatomist famous in his day is thus summarily disposed of, one cannot wonder that the lesser lights of our times are simply annihilated when their testimony is contrary! Surely it is high time we demanded intelligent criticism, instead of unproved assertions and assumptions.

Finally, it is matter for grave regret that the mass of post-mortem material which we now possess should remain useless in so many ways because of the absence of clinical histories of the cases. The pathologist has rarely had the opportunity of exercising his true function—that, namely, of demonstrating the connection between morbid processes occurring during life and palpable changes found after death. All the greater weight must therefore be attached to those cases—as yet unfortunately few—in which observation during life has been followed by post-mortem examination. There is urgent need of more work in this direction.

Having prepared the way with these preliminary observations, let us now review the lesions found in focal suppuration in the nose, limiting ourselves to those about which there is no doubt.

As regards morbid anatomy, the recent works of Zuckerkandl and Harke may be referred to; here we shall deal especially with observations recorded in foreign literature, and my own experience on patients.

I. The Antrum of Highmore.

The mucous membrane of this cavity undergoes considerable changes in acute inflammation, as Harke's observations were the first to show. His cases enable us to judge approximately of the duration of the disease. Amongst deaths from infectious diseases, he has twenty-three cases of empyema of the antrum, of which seventeen cases, with in all twenty-seven diseased cavities, may be considered as acute (Cases 4, 17, 21, 31, 42, 70, 77, 79, 87, 120, 134, 158, 185, 208, 215, 225, 325).

The mucous membrane was generally swollen, brawny, or soft and gelatinous; redness does not seem to have been pronounced, as it is only mentioned a few times. Cysts occurred in three cavities (Cases 31 and 325); hæmorrhages in five (Cases 21, 79, and 225); the mucous membrane of one cavity showed greenish-black discoloration.

Amongst deaths from non-infectious diseases, only five cavities were found (Cases 18, 44, 102) in which the morbid process might fairly be considered acute. There was swelling of the mucous membrane, but no hæmorrhages. The observations on acute cases are much more numerous and definite in the case of children; in forty deaths from infectious disease, double empyema of the antrum is noted in almost every case. Redness and swelling of the mucous membrane are nearly always noted; only once (on both sides) are hæmorrhages also described. Thus it is evident that the latter condition is a decided rarity, especially if one considers that amongst all the rest of Harke's cases of doubtful, or certainly longer, duration, hæmorrhages are only once recorded (Case 214). This does not look like the 'easy vulnerability' with which Zuckerkandl

credits the mucous membrane of the antrum. Notwithstanding the certainty with which Zuckerkandl, in his book, describes acute and chronic cases, it is quite uncertain, owing to the entire absence of clinical data, how far his descriptions apply. Indeed, it appears certain, that the œdematous swelling which he describes in connection with chronic catarrh, is identical with that soft gelatinous or brawny swelling of the mucous membrane which is described by Harke in numerous cases which were certainly acute.

Chronic suppuration leads to more extensive changes. The presence of secondary swellings and tumours in the nose, and the nature of the actual pathological conditions found, justify us in assuming that thirty-four of Harke's cases were more or less chronic (Cases 19, 24, 35, 41, 62, 83, 94, 99, 123, 151, 159, 174, 197, 203, 214, 232, 246, 260, 261, 264, 276, 287, 307, 319, 327, 329, 332, 336, 342, 346, 349, 360, 367, 395). In most of those cases only swelling of the mucous membrane, often of a brawny character, is noted. Cysts occurred three times, polypi four. In six cavities the mucous membrane was 'smoke gray,' partly granular, and 'caviare-like.' In three such cases it is worth noting that the disease originated from teeth. Thickening of the membrane, partly described as 'permanent,' occurred in seven cavities.

Probably this 'permanent thickening' corresponds with the transformation of the mucous membrane into a pyogenic membrane, as I have elsewhere described it. The glands and much of the epithelium disappear, and are replaced by connective tissue. Analogous changes occur in suppurative otitis media. I have in another place⁽⁴³⁾ briefly described the permanent changes in the lining membrane of the frontal sinus in cases of empyema, and the same description applies to the antrum. These microscopic changes have been confirmed from the anatomical side by Zuckerkandl⁽⁴⁷⁾, who writes (p. 78): 'Finally, it comes about that the mucous membrane is converted into a dense wavy connective tissue, containing but few cells, so that one might speak of a fibrous degeneration of the mucous membrane.' This description corresponds more with a completed process, yet he records one case (No. 7, p. 76) in which an active chronic empyema, with destruction of the

glands, is in question; and another (Case 5, p. 75) in which the epithelium was shed, 'possibly in consequence of decomposition,' without explaining why decomposition should be a more likely factor in this case than in others.

Finally, we find mention of villous and fungoid processes on the thickened parts of the mucous membrane. What one can ascertain in the living subject corresponds with this description.

In earlier communications, I described the mucous membrane as being in parts converted almost into a cushion of granulation tissue, so that one could remove thick pieces with every stroke of the sharp spoon. In many cases these growths were necrotic, mixed with cheesy pus, forming a yellowish discoloured mass in which it was difficult to distinguish tissue from secretion.

In other cases the cavities were for the most part smooth, and granulations occurred only in carious places, but there always.

Lately I have opened the antrum thirty-seven times (in twenty-two patients) from the canine fossa, and have made the opening large enough to expose the cavity freely. In four cases no note was made of the condition of the lining membrane, but in the other thirty-three cases it was as follows: five times the mucous membrane was smooth; five times it showed cushion-like thickenings; three times there were exuberant granulations in the cavity; twice the bone was partly exposed, but smooth; three times there were carious spots to be felt in the wall; four times granulations were found close to such erosions of bone; eight times rough but firm inequalities of exposed bone could be felt; and three times there were considerable defects of the inner wall, communicating with the middle ethmoidal cells.

Twice I found little polypi, of which one was washed out on the third day with some granulations, after the plug was removed. It was pedunculated, and as big as a pea.

Diseases of bone, as just mentioned, are not rare. Unfortunately, I have no detailed record of the greater number of my earlier operation cases; the short notes I had were destroyed after I had used them for my first edition. I regret this all the more since Zuckerkandl, in opposition to my observations, has maintained that he has never observed caries as a consequence of empyema; a statement which is apt to mislead. I have still

notes of the conditions found in nine cavities (eight patients) of my early series of cases. Thus, in two were circumscribed carious areas; in three were larger defects, once of all the walls, twice of the inner wall only; in two cases the inner wall was covered with granular thickened mucous membrane; in one case the bony walls were roughened, but not softened; and in one case the inner surface was smooth.

In considering the above results, the expression 'granulations' must be taken with a grain of salt, for it has often been impossible to decide whether the inflammatory growths consisted entirely of small round cells, or contained also original elements of the mucous membrane, as is often the case in the nose. Further, it must not be supposed that a mucous membrane is normal, in every case in which it is described as 'feeling smooth and intact.' The majority of the cases were years old, and it is therefore more likely that this smoothness was due to increase of connective tissue in the membrane.

In the same way with the expression, 'firm rough bone.' Only where the inequalities of surface are considerable will one venture to put it down to the formation of osteophytes; while the more uniformly rough parts are probably due to chronic otitis.

The term 'caries' is applied, as in general surgery, to bony areas which are rough and softened. My results differ from Zuckerkandl's in this, that I have more frequently observed the second stage of chronic suppurative periostitis, namely, ulceration of bone; while he has more frequently observed the plastic forms of the process, which lead to the formation of osteophytes and scales of bone.

But cases of destructive bone disease occur also in Zuckerkandl's book (³⁷), and when he explains (p. 361) that he has never observed caries as the result of empyema of the antrum, his statement is in contradiction with some of his own earlier observations. On p. 324, under the heading 'Defects of the Walls of the Antrum,' he says: 'The swelling of the infra-orbital canal shows four such defects, the result of suppuration.' The fact that the suppuration in this case was the result of an injury, and that the injury did further damage, does not alter

the nature of the lesion produced. The last objection does not apply to the observations on p. 176 of vol. ii. We find there a description of a macerated preparation, showing a communication between the antrum and the socket of a molar tooth. There is, of course, no clinical history, but the disease of the tooth no doubt broke through into the antrum, and empyema must certainly have been present.

Again, on p. 182, 'empyema of the right antrum, with marked changes in the nose,' and the following extracts: 'The lower turbinal pierced by many holes.' 'The middle turbinal thinned and riddled with holes . . . in its central portion a loss of substance. . . . An opening 27 mm. by 23 mm. through which the antral and nasal cavities are in free communication. . . . In the lower meatus the outer wall is perforated at one spot . . . signs of caries in the alveolar process in the form of little gaps and hollows.' The want of precision in the above report leaves one uncertain, so that one can only guess that the defect in the outer wall of the lower meatus corresponds with the mesial wall of the antrum.

In the same way I cannot be sure whether the carious defects in the alveolar process communicate with the antrum, so that they could have been felt on probing the cavity in the living subject.

Quite unambiguous, however, is the condition in Case 7, p. 185 of the same volume—'Empyema of the antrum following caries of the alveolar process'—where he says: 'The body of the jaw softened on both sides, with loss of substance exposing the mucous membrane' (according to which it seems as if the defect could not have been felt from the inside during life); but further, 'The left antrum presents a carious spot in its posterior upper angle, so that the soft parts of the infra-temporal fossa are in contact with the mucous membrane of the cavity.'

The interpretation of the case: first caries, then empyema, is quite arbitrary; according to all clinical and pathological experience, we have just as good, or a better right to say: first empyema, then caries.

In my more recent observations carious areas were found at all parts of the inner wall, even high up on the roof, and

in the orbital recess; while on the other hand, necrotic loss of substance was only observed mesially.

Only one of the extirpated polypi was available for examination, as the other was lost. It was a granulation tumour of loose texture, consisting of round cells closely aggregated, and some remains of glands.

Only a few cases of bone disease have lately been recorded as having been observed during life, and those chiefly of extensive disease of the antrum. This is probably because simple puncture of the cavity is generally practised, and through such an opening it can neither be subjected to direct scrutiny, nor probed with any certainty.

Bouchut⁽⁶⁰⁾ observed softening of the antral wall, which he describes as carious, in an infant of two months. It was caused by acute suppuration.

Jansen⁽⁶¹⁾, whose practice it is to expose the sinuses very freely, speaks of 'carious processes in the bony walls, with extensive loss of substance towards the orbit, and sequestra in the nasal wall.'

Schultz⁽⁶²⁾ describes the case of a child of 7, in whom, after extraction of one of the upper molars, an abscess formed in the antrum, and caused necrosis of the upper jaw, nasal and malar bones.

Fürst's⁽⁶³⁾ case, in which, after an attack of gonorrhœal ophthalmia, a phlegmonous condition of the cheek came on, with empyema of the antrum and complete necrosis of the upper jaw, may be included here, seeing that gonococci were found in the pus from the eye, but not in that of the abscess.

Downie⁽⁶⁴⁾ removed a piece of dead bone from an antrum. The cavity was suppurating, and an incisor tooth was fixed in the anterior wall.

Flatau⁽⁶⁵⁾ observed an antral empyema burst into the nose, thus making a hole in the mesial wall.

Bone disease affecting the region of the ostium, and the hiatus semilunaris, will be considered under the ethmoid.

As regards the structure of polypi of the antrum, and the occurrence of cysts, I refer the reader to well-known anatomical works; such conditions can in the nature of things hardly be diagnosed in the living body.

II. The Ethmoid Bone.

According to the anatomists, the changes found in the mucous membrane covering this bone are slight.

Zuckerkindl⁽³⁷⁾ only met with three cases* of empyema of the ethmoidal cells, and he tells us nothing on this point.

Harke, in reporting fourteen cases of suppuration in the ethmoidal cells, remarks in seven of the fourteen that the mucous membrane was swollen, brawny, and sometimes reddened. He found no disease of bone, and this is not to be wondered at, when one considers that almost all his material was derived from acute cases.

More has been learned in the course of operations.

Jansen⁽⁶¹⁾ found the ethmoidal cells filled with granulations in eight cases in which he had occasion to lay them freely open. It must, however, be remembered that changes in the mucous membrane of the ethmoidal cells would have to be very great before they could be observed by rhinoscopy, and that is the reason why the formation of polypi is almost the only change of which we find mention. Bosworth⁽⁶⁶⁾, in speaking of 'intracellular myxomatous degeneration,' presumably speaks of what he has seen.

In my first paper such a case is recorded. The case which Roth⁽⁶⁷⁾ briefly describes was apparently similar: 'There was swelling of the anterior end of the middle turbinal, with persistent discharge of pus from the nose. On opening this swelling a polypus as big as a hazel-nut was found inside; there was no disease of the bone, and after removal of the polypus the suppuration ceased without further treatment.'

I can largely supplement this list from my more recent statistics of ethmoidal empyema.

CASES I to 9.

1. Left ethmoidal labyrinth freely opened (after removal of middle turbinal), on account of suppuration which had lasted for years. Two small polypi were found in the cells.

* Pp. 363-367, Cases 4, 7, and 33. The case mentioned in vol. ii., p. 207, may or may not have been ethmoidal empyema. It was found in a macerated skull.

2. A wide rough-walled cavity full of pus, situated above and external to the right middle turbinal. The cavity having been freely opened, several polypi as big as peas were found inside.

3. Complete destruction of the left middle turbinal, the inner wall of the antrum, and the majority of the ethmoidal cells, so that, after removal of hypertrophic mucous membrane, the ethmoid labyrinth was represented by a great gap. The inner wall everywhere showed polypoid degeneration.

4. In both middle turbinals wide pus-containing cavities. (There was also double antral empyema, the pus from which was discharged through the infundibulum, laterally from the openings of these cavities.) On the right side a few small polypi grew from the lower lip of the hiatus semilunaris, and on both sides similar growths were found in the upper part of the cells inside the hiatus.

5. After clearing out the middle meatus on both sides by free removal of the middle turbinals, one obtains access, on both sides, externally, about the middle of the nose, to little bony cells, containing inspissated pus and also small polypi.

6. The middle turbinal having been removed and the middle ethmoidal cells exposed, several little flat grayish-red polypi bulged out.

7. A very large flap-like polypus was removed, together with its bony attachment. The latter was found to consist of a boat-shaped shell of bone made up of two plates, and representing the lower part of a distended middle ethmoidal cell. The inner surface was lined with a thick gelatinous-looking cushion of mucous membrane, in a state of polypoid degeneration.

To the above I will add two cases of inflammatory granulation growths, in one of which new bone was formed :

8. Loss of substance in left middle turbinal after operation. Externally and posteriorly, a rough-walled trough-like suppurating cavity in the bone, which was, as far as possible, exposed. A year later : In place of the cavity previously seen, there was a smooth, red, shining tumour, ending posteriorly in a knob-shaped extremity. A piece of the growth was removed with the cold snare, and showed a structure similar to that which I shall presently describe as common to secondary growths of the mucous membrane in cases of suppuration—*i.e.*, inflammatory hyperplasia of all the elements of the mucous membrane. A small ridge of bone lay beneath the mucous membrane and parallel to its surface. Cell division

could only be seen in the infiltrating round cells. (The preparation was stained by Flemming's method.)

9. From the outer side of the right middle turbinal pus welled forth. Above and externally the probe entered a large rough-walled cavity full of granulations—the anterior ethmoidal cells.

Macdonald⁽⁴²⁾ also found granulations inside a cavity full of pus, in the middle turbinal.

Destructive inflammation of the mucous membrane inside the cells has not as yet been observed in the living subject, but such inflammation has occasionally been met with on the turbinals, in consequence of purulent discharge in the neighbourhood, and as an early stage in diseases which attack the bone. In one case of antral empyema, I was fortunate enough to find an ulcer of the soft parts on the mesial surface of the middle turbinal, which I had removed by operation. A section of this ulcer is shown in Plate I., Fig. 1. There is a deep ulcer of the mucous membrane, with the remains of glands still visible in its base, and the bone shows fibrous degeneration. The ulcer was entirely caused by local irritation, and was due to the fact, that while the middle turbinal was closely applied to the septum, pus from the antrum found its way in between the two.

Of the slighter forms of ethmoidal bone disease we may next mention **Osteophytes**.

The only case of this sort known to me is Bull's⁽¹⁶⁾. On the other hand, **carious destruction** of greater or less extent is frequently recorded.

For the sake of convenience and natural arrangement, I will take together all affections of this sort, both inside and outside the ethmoid bone and cells.

The facts in the following cases were established by post-mortem examination.

Otto⁽⁶⁸⁾: Communication of the right frontal sinus with the nose, through a defect in the lamina cribrosa and papyracea.

Schäfer⁽⁶⁹⁾: Caries of the lamina papyracea, involving an area 1 cm. square.

The Author (see under 'Abscess of the Mouth'): During life, absence of the lamina papyracea and the whole of the left

ethmoid labyrinth. Post-mortem: Caries of the lamina cribrosa was also found. This case was complicated during life with recurring polypi, and furnished the proof, afterwards desired by Zuckerkandl, of the co-existence of these conditions.

Knapp (⁷⁰): Meningitis at the base, and on the convexity of the hemispheres, originating from empyemata of the frontal sinus, ethmoidal cells, and left antrum. 'Nowhere necrosis, but at various points caries, also on the surface of the left turbinal.'

Farther observations by Meyer, Schütz, Begbie, Pekostawski, and Browne are recorded later on. (See under 'Intracranial Suppuration.')

Equally valuable are the following reports of post-mortem examinations:

Hartmann (⁷¹): In the centre of the middle meatus was a sponge-like granular mass, from which pus welled forth. Behind this the probe came against movable bone, which proved, when removed, to be a thin sequestrum, 17 mm. long and 6 mm. broad.

Steinthal (⁷²): After free exposure of the frontal sinus, the lamina papyracea was found to be partly carious.

Jeaffreson (⁶): Retrobulbar suppuration. Enuclation. The whole bone in the region of the foramen opticum and the sphenoidal fissure was bare and dead, but not yet separated. During the next four years little bits of bone came away.

Baasner (⁷³): Free exposure of an orbital abscess. Loss of substance in the lamina papyracea and cribrosa.

Kipp (⁷⁴): The frontal and sphenoidal sinuses, and the ethmoidal cells, were converted into a large cavity, presenting on its spacious walls numerous sharp splinters of bone.

Knapp (⁷⁵): 1. Empyema of the ethmoidal cells. Opening from without. In the ethmoid bone a cavity 3 cm. in diameter, with rough, bare walls.

2. Combined empyema of sphenoidal sinus and ethmoidal cells. Opening from without. Extensive caries in the exposed cavity.

Stewart (⁷⁶): An abscess in the inner angle of the right orbit, which had been several times opened during the last twenty years. Five years ago the abscess ruptured into the

nose. In the nose, instead of the right middle turbinal, there was a broad, hard, tense swelling. On opening this swelling its interior was found to communicate with the orbit, and also with the frontal sinuses. A number of sequestra were found inside.

Kühnt (⁷⁷): The greater part of the ethmoid labyrinth merged in the suppurating frontal sinus (Case 9).

Of microscopical examinations of preparations taken from the living subject, we have the following :

Woakes (⁷⁸), as he tells us, removed twenty middle turbinals, which he handed over to Martin, the pathologist, for examination. In nine cases there was absorption of bone, (thinning and the formation of Howship's lacunæ); in some cases the bone was replaced by fibrous tissue; and in every single case complete and partial necrosis. In some preparations the bone was distended by cysts of the mucous membrane.

Martin (⁷⁹) confirmed these results, but declined to be answerable for their interpretation, as he knew nothing of the history of the preparations. Of course, one must take Woakes's word for it that the preparations were derived from middle turbinals, but I see no reason to doubt it—all the more as the results correspond in several respects with my own. In most of my own cases in which diseased bone has been removed I have not examined it, as it has been too much spoiled by the operation.

In addition, the cases were few, for in most of the cases of bone disease that came under my observation, the disease was in situations from which it could not be removed. Amongst the large number of middle turbinals, however, which I have been obliged to remove, there were only a few which showed spots of secondary caries, caused not by the original disease of the spongy bone, but by the prolonged irritation of pus reaching them from other regions of the nose.

The first of these preparations is specially instructive, because it exemplifies the first stage of destructive inflammation of bone, proceeding from the periosteum.

A large dilated ethmoidal cell filled with pus during life, ('bone cyst' of the middle turbinal) was removed entire. Both

its outer and inner walls showed polypoid degeneration (see above, p. 28, Case 7). Part of the mucous membrane of the outer wall, which had been specially exposed to the discharge from a co-existing frontal empyema, appeared reddish-gray and uneven, and was firmly adherent to the bone. Under the microscope the surface of the bone was seen to be hollowed out here and there by an encroaching growth of round cells, which took the place of periosteum in uniting bone and mucous membrane, whilst at other points these structures were distinctly marked off from each other.

Here, then, we see the first beginning of absorptive periostitis, in continuation of a process affecting only mucous membrane, as seen in Case 10.

The following three preparations show more advanced stages of the inflammation :

1. Empyema of left antrum, ethmoidal cells, and sphenoidal sinus. The middle turbinal was removed, decalcified in hydrochloric acid, and imbedded in photoxylin. Horizontal sections were made, and stained with alum-carmine. On the lateral aspect of the turbinal there was a loss of mucous membrane, and the bone was exposed and softened. This corresponded with the following microscopic appearances ;

Both edges at one side show a narrow strip of mucous membrane still remaining, but densely infiltrated with small cells. Between the edges, mucous membrane is entirely absent, and the free surface is formed by a greatly thickened and infiltrated layer of periosteum ; in the centre is an area of exposed bone. The central portion of this bony surface shows hillocky elevations ; at one side there is no bony tissue to be found on the surface, but a deposit several layers thick of round and spindle-shaped cells, continued without a break into the substance of the bone, which is also similarly infiltrated at the edge. From the bone on the near side a transverse prolongation extends downwards towards the deeper part of the section, to the bone of the far side (which, of course, cannot be seen in the drawing) ; but this prolongation is so infiltrated with small cells that the bony structure has quite disappeared. The latter surface is only bare of mucous membrane and periosteum over quite a small area, but the continuity of the bone on this surface is interrupted by a deposit of small cells extending from the surface towards the deeper parts, and passing gradually into the bone without any distinct line of demarcation.

Anatomical Diagnosis : Superficial granulating ostitis and periostitis, with partial hyperplasia of the bone under an ulcer of the mucous membrane.

Fig. III.



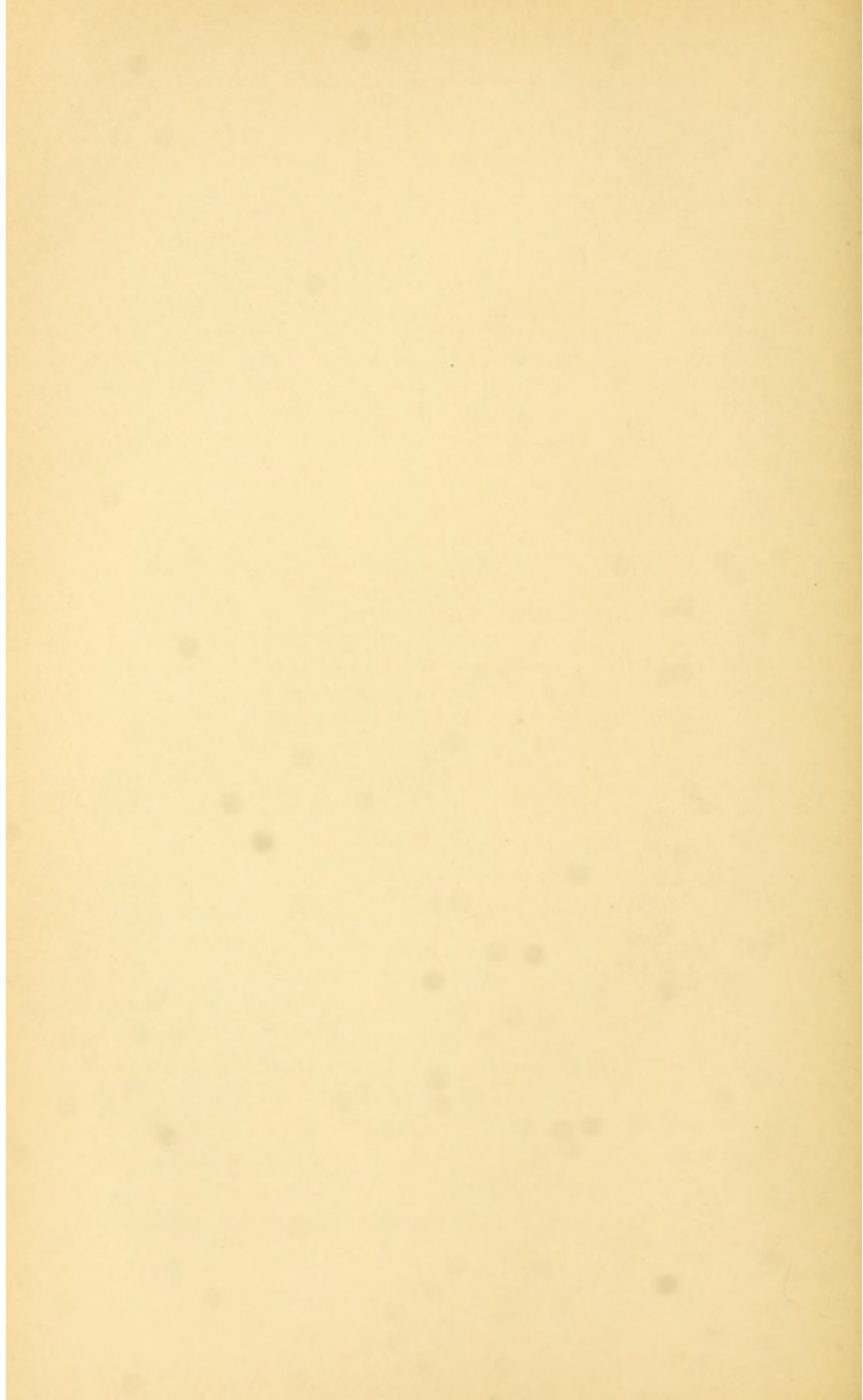
Fig. II.



Fig. I.



For description see pages 32 + 33.



2. Empyema of both frontal sinuses. The right middle turbinal presented on its outer surface a rough softened area. The bone was removed entire and decalcified in picric acid, and horizontal sections were prepared and stained with hæmatoxylin.

Plate I., Fig. 3, represents the appearances under the microscope. On the lateral aspect a small surface is still covered by epithelium. A little submucous tissue is also left; then this disappears, exposing connective tissue with vessels, and finally the bone itself. All the soft parts are densely infiltrated with small cells, which show in parts no nuclear staining, so that the colour lies in homogeneous masses. The exposed area of bone displays multiplication of nuclei towards its circumference, so that its edge passes insensibly into small-celled connective tissue. The parts of the bone which extend laterally are here and there unrecognisable, a continuous transformation into connective tissue having taken place. One superficial part is covered with a tag of almost homogeneous tissue, in which only a few round nuclei appear stained. The continuity of the bony surface is interrupted at several points.

Diagnosis: Granulating and rarefying ostitis, with loss of substance under an ulcer of the mucous membrane.*

3. Secondary empyema of the sphenoidal sinus and ethmoidal cells. Carious area on the outer surface of the right middle turbinal (not shown in drawing). Treated in the same way as the previous preparations, there is seen at points where the bone is bare (*a*) dense small-celled infiltration of the remaining soft parts, and (*b*) a continuous transformation of the surface into granulation tissue, the exposed parts showing homogeneous masses of colour.

Diagnosis: Granulating ostitis with loss of substance.

A similar ulceration on one of the spongy bones in consequence of empyema was observed post-mortem by Knapp⁽⁷⁰⁾. I see no reason to describe these changes otherwise than as caries, and I shall in future so designate them.

Rhinoscopic observations on inflammation and ulceration of bone in the living subject are much more numerous than pathological specimens. Of the earlier ones I may mention the following: Noyes⁽⁸⁰⁾, in a case of acute orbital abscess, observed a fistula under the lower eyelid, communicating with the nose. Several pieces of bone were discharged through the fistula, which then healed (necrosis of lamina papyracea).

* It is to these two preparations that Professor Bollinger's confirmation of diagnosis refers. See above.

Next come Schäffer's⁽⁸¹⁾ two cases, found amongst thirteen cases of empyema. Then Kahsnitz's⁽⁸²⁾ observations, which are unfortunately brief; but he speaks of having observed caries of the ethmoidal cells several times.

Then Moldenhauer's⁽⁸³⁾ six cases of ulceration of bone on the outer wall of the nose, and once also on the lower turbinal — 'apparently primary diseases of the bony walls of the nose, having the character of a limited caries or necrosis.'

Finally we have Schech's⁽⁸⁴⁾ opinion, according to which 'caries of the outer wall of the nose, and especially of the bones forming the hiatus semilunaris and its neighbourhood, may be demonstrated by feeling bare rough bone with the probe.'

Woakes's cases ought perhaps to be included in this place, but they have been so keenly disputed, and the interpretation put upon them by their author has so confused the whole matter, that I will for the present leave them. Krieg⁽⁸⁵⁾ observed necrosis of the ethmoid several times during life.

In one of my earlier papers, I myself proved by numerous observations that bone disease the result of periostitis of the ethmoid was no rarity; and I reported upwards of twenty-one cases of caries of the ethmoid, and thirty-two cases of ethmoidal empyema, many of the latter showing erosion of bone. Since then a farther series of observations has been published.

Wilkin⁽⁸⁶⁾ remarks: 'Frequently in cases of nasal polypus, both before and after removal, I have found spicules of loose bone, usually in the upper part of the middle turbinated body.'

Jansen mentions a case in which a suppurating frontal sinus was connected by a bony fistula with the diseased ethmoidal cells.

Bryan⁽⁸⁷⁾ describes suppuration of the ethmoidal cells resulting in caries.

Wingrave⁽⁸⁸⁾ reports a case of suppurative ethmoiditis of the anterior cells, with caries.

Salzburg⁽⁸⁹⁾ records fifteen cases, from Seifert's out-patient department, of carious destruction of the ethmoid, sometimes very extensive. In fourteen of the cases there was no evidence of either tubercle or syphilis; all were the result of suppuration, occurring either inside the cells, or on the surface of the bone.

Bresgen⁽⁹⁰⁾ in his more recent works mentions several similar observations. After mentioning that, 'in the course of this year' (after the appearance of the first edition of this monograph), 'since I have given special attention to the subject, I have observed polypoid growths the result of suppurative disease of the ethmoid,' he records the condition of the accessory sinuses in nine cases of 'ozænic' suppuration in the nose⁽⁹¹⁾ as follows:

1. Rough bone in the ethmoid.
2. Ditto.
4. Ditto.
5. Diseased bone in middle turbinal.
6. Diseased bone in ethmoid.
7. Diseased bone, ethmoid.
8. Diseased bone, probably ethmoid.

'It is noteworthy that in every case in which I located the disease in the ethmoid, rough bone could be felt.'

In another place, the same author⁽⁹²⁾ mentions a small rough suppurating bony area at the anterior part of the middle meatus; and in a case in which empyemata of the antrum, frontal sinus, and anterior ethmoidal cells were present, he describes rough bone close to the attachment of several mucous polypi to the middle turbinal.

Flatau⁽⁹³⁾ records a cases of empyema with caries of the ethmoidal cells.

Baumgarten⁽⁵¹⁾ published a lecture on cases of ethmoidal empyema in which he had observed caries and necrosis of this bone; but it is impossible to make out from the report which of the cases were not syphilitic or tubercular.

My more recent observations comprise in all fifty-five cases, in thirty-one of which caries could be demonstrated. (I have only diagnosed as caries cases in which rough softened bone could be certainly recognised in the suppurating area, and where the probe could be passed into wide cavities in the bone. When the diseased parts could only be approached through narrow openings, I have left the diagnosis in suspense.)

In ten cases I could not be certain that the bone was carious; in fourteen it was certainly healthy.

In many cases one got the impression that the cavity in the

bone was formed by the coalescence of several cells, but this was only an impression, and of course incapable of proof. In other cases (seven in all) considerable loss of substance was found in the middle turbinal, the uncinatè process, and neighbouring parts. It is noteworthy that six of these cases were complicated with empyema of the antrum, and the loss of substance was generally in the lateral part of the ethmoid and lamina papyracea.

In addition to those ulcerations of bone which occur in the ethmoid as the result of suppuration, I have recently observed nine cases of such affections arising in consequence of, or at least in connection with, circumscribed suppurations of the meatūs. Such cases I formerly described as caries of the ethmoid. The subject will be referred to by-and-by.

III. The Sphenoidal Sinus.

Zuckerkandl and Harke have described the mucous membrane of these cavities as being swollen and brawny in inflammation, red in colour, and showing hæmorrhages on the surface and in the substance of the membrane. Zuckerkandl mentions cyst formation.

Hartmann⁽⁹⁴⁾ reports enormous swelling of the mucous membrane.

Suchannek⁽⁹⁵⁾ found the mucous membrane of the antrum and sphenoidal sinus in acute inflammation to be partly hyperæmic, partly œdematous.

In fifty-one cases of sphenoidal sinus suppuration I have three times found polypi in the cavity. There was at the same time ethmoidal empyema, and once polypus formation in the ethmoidal cells (*vide supra*, Case 2).

Flatau⁽⁷⁾ scraped granulations out of a suppurating sinus, as I myself did in an earlier case.

Disease of the bone has not been observed by the anatomists. This is in opposition to the results of post-mortem examinations as made by Scholz⁽⁹⁶⁾, Pekostawski⁽⁹⁷⁾ and myself, and the clinical observations (long known) of Schäffer, Schech, Demarquay, Quénu, the author, and Baumgarten, to which I shall refer farther on.

In the meantime the following additional observations have been made :

Schäffer⁽⁹⁸⁾ recently described erosions and necrosis of the anterior wall of the sinus.

Herzfeld⁽⁹⁹⁾ showed a patient (a woman) with caries and empyema of the sphenoidal sinus.

Schuster⁽⁴⁰⁾ found with the probe an area of rough bone as big as a sixpence in a suppurating cavity.

In Flatau's case, mentioned above, there was caries of the sphenoid; and Bresgen⁽⁹¹⁾ detected diseased bone on one occasion in the right sphenoidal sinus.

My own clinical observations on disease of the sphenoidal sinus are fifty-one in number, and were made on thirty-seven patients. In nineteen sinuses the bone was intact; in two it was exposed, but not eroded; twenty-six presented symptoms of suppurative ulceration of bone (including one case of necrosis), as follows: thirteen times in the interior of the cavity, thirteen times at the ostia only. Notes of four cases are wanting. It is noteworthy that one of the latter cases had been many times previously examined, and found to be suffering from catarrh of the sinus, with a purely mucous secretion of a gray colour, the bone and mucous membrane being intact. A considerable time after the cure of this catarrh, purulent secretion showed itself, and the ostium of the sinus was found to be carious. (Had the probing anything to do with this?)

Amongst the diseased sinuses there were two in which the secretion could only be regarded as catarrhal, and in which the anatomical evidence was negative.

In addition, I have the records of two post-mortem examinations in which all four sphenoidal sinuses contained pus, but showed no farther change.

IV. The Frontal Sinus.

Suppuration in this cavity appears to have a special tendency to produce grave secondary changes in its inner wall, and here again the chance observations of the anatomist are not in accord with clinical experience. (The latter possesses in this case all the precision of anatomical data, as the cavities are freely exposed and can be exactly inspected.)

Zuckerkandl observed only swelling, œdema, and hæmorrhages in the mucous membrane, and he also mentions cysts several times—whether in connection with suppuration he does not say—but he makes no mention of polypi, and does not seem to have remarked necrotic processes in the bone.

Harke, in examining thirty sinuses, describes only redness and brawny swelling of the mucous membrane, and in a few cases hæmorrhages.

As regards changes in the soft parts, polypi are most frequently noted, *e.g.*, by Knapp ⁽¹⁰⁰⁾, Hulke ⁽¹⁰¹⁾, and Ogston ⁽¹⁰²⁾; and granulations by Knapp ⁽¹⁰³⁾, Gabszewicz ⁽¹⁷⁾, Ogston, Jansen ⁽⁶¹⁾, and Herzfeld ⁽⁵⁹⁾. Engelmann ⁽¹⁰⁴⁾ reports the removal of two mucous polypi and some polypoid granulations from a suppurating sinus, and Scheinmann removed a small polypoid swelling from the floor of such a sinus.

I myself have, up to the present, freely exposed thirteen suppurating sinuses (occurring in nine patients), and I have only twice found the mucous membrane quite smooth. In the other cases, ulceration extending to the bone was present in six; in four there were also small polypi, and in one the mucous membrane was degenerated and covered with granulations.

The observations on the condition of the bone are more numerous, but it must be remembered that the majority of them relate, not to cases of so-called 'latent' empyema, but to cases which have ruptured externally. The distinction is a purely clinical one, pathologically there is no difference; a latent empyema must, if the outlet through the nose be closed, rupture externally, as an empyema necessitatis.

We find the following observations:

Welge ⁽¹⁰⁶⁾: Carious destruction of the septum and lower wall.

Bousquet ⁽¹⁰⁷⁾: Suppuration of the right frontal sinus with perforation into the orbit and anterior cerebral fossa.

Beer ⁽¹⁰⁸⁾: Complete softening and perforation of the lower wall (a second case of Beer's was apparently syphilitic).

Riberi ⁽¹⁰⁹⁾: (1) A fistula in the orbital wall, and a sequestrum in the sinus; (2) corrosion of the anterior wall.

Schanz ⁽¹¹⁰⁾: A fistula in the inner angle of the orbit, with

granulation growth ; the probe touched bare bone in the deeper part of the wound. (This case is a doubtful one, for bare bone is not necessarily diseased, and abscess of the orbit may arise by lymphatic infection, or through natural defects in the bone, without perforation of the wall of the sinus.)

Equally questionable, for the same reason, are some cases recorded by Noyes (⁸⁰), Trykmann (¹¹⁶), and Walker (¹¹⁷), in which rupture took place in the inner angle of the orbit.

Becker (¹¹¹): Erysipelas, phlegmonous inflammation of the forehead and nose, rupture, incision, discharge of a sequestrum.

Mason Warren (¹⁴): Traumatic suppuration, evacuation after four years, extensive caries, and later, the discharge of a sequestrum.

Scholz (⁹⁶): Necrosis of the sphenoid and the frontal bone in consequence of suppuration.

Magnus (¹¹²): Perforation of the anterior wall through suppuration.

Macnaughton Jones (¹¹³): (1) Rupture first into the nose, and then into the orbit ; in the latter, extensive carious destruction : (2) rupture into the orbit : extensive necrosis.

Spencer Watson (¹¹⁴): (1) Rupture into the orbit ; two sequestra removed from the orbital wall : (2) an ulcer at the root of the nose on the left side, and a swelling over the left frontal sinus. Syphilis denied. Sequestrum of the anterior wall. (The case is not reliable ; syphilis cannot be excluded.)

Otto, already described, p. 29.

Bull (¹⁶): Traumatic empyema, communicated to the sinus of the other side by caries. Extensive loss of substance through caries.

Soelberg Wells (¹¹⁵): Large carious gap in the lower wall.

Knapp : (1) Autopsy : a narrow perforation towards the horizontal process of the frontal bone, with a small area of dead bone (¹⁰³) : (2) rupture towards the orbit imminent ; plates of bone forming the walls of the cavity necrotic (¹⁰⁰) : (3) autopsy : gaps in the roof of the orbit (¹⁰⁰).

Kipp, already mentioned, see p. 30.

Gabszewicz (¹⁷): Traumatic phlegmon of the forehead with out injury of bone. Then secondary frontal empyema. In the cavity two sequestra and granulations.

Melatas-Lany (¹¹⁸): Perforation of the left upper orbital wall into the frontal sinus.

Hulke (¹¹⁹): Perforation downwards, extensive loss of substance in the orbital wall of the sinus.

Wiedemann (¹²⁰): Necroses of the anterior wall with abscess formation (*vide* p. 22).

Steinthal (⁷²): After opening both sinuses from without, no passage to the nose. Secondary caries of roof of right orbit.

The Author (⁴³): Latent empyema on right side. Carious area on the outer wall.

Scheinmann (¹⁶⁵): Latent empyema. A carious spot on the inner wall.

Jansen (⁶¹): (1) A fistula leading downwards; the floor of the sinus partly destroyed: (2) perforation of the mesial wall of the orbit leading into the frontal sinus: (3) gap in the septum between the two sinuses.

Herzfeld (¹²¹): Three cases, one with a large fistula of the anterior wall.

Krecke (¹²²): A fistulous opening as big as a bean in the bone at the edge of the eyebrow.

Kuhnt (⁷⁷) examined fourteen sinuses, and found the mucous membrane partly thickened, partly converted into granulations, and in other cases spongy, friable, and gray in colour. Twice there were bony fistulæ leading from the orbit, but not connected with the sinus; once such a fistula opened into the sinus.

In two cases the bony walls were discoloured and brittle (osteoporosis Kuhnt calls it); in two there was well-marked necrosis, which opened in one instance into the ethmoid labyrinth. Thus, in 50 per cent. of all cases there was disease of bone. I must leave out of account the cases which Kuhnt did not submit to operation, as it is impossible to exclude error in diagnosis, and the exact condition of the interior of the sinus could not, of course, be made out.

My own more recent operation cases presented the following conditions:

1. Latent empyema. Walls smooth.
2. Latent empyema on both sides. Walls extensively carious.

3. Latent empyema on both sides. A carious area in the bottom of a deep recess in the outer wall of the left sinus.

4. Latent empyema. Polypoid degeneration of the mucous membrane. Bone intact.

5. Latent empyema. Polypoid degeneration of mucous membrane, with a considerable area of rough and softened bone; projecting from the posterior wall a pyramid-shaped exostosis as big as a lentil-seed.

6. Latent empyema on both sides. In both posterior walls carious gaps exposing the dura. Secondary cerebral abscess.

7. Left frontal sinus of a case already published (⁴³). Latent empyema, fœtid pus, polypi, bone intact.

8. Left latent empyema. Mucous membrane smooth, and dark red in colour.

9. Right latent empyema. Sinus full of polypoid growths. Bone intact. In this case I examined one of the little polypi. It presented the characters of a soft œdematous papilloma.

Several other cases of extensive bone disease will be referred to later, in treating of intracranial suppuration.

From the above résumé of pathological facts one can only conclude that we are not yet in a position to formulate any scheme of classification embracing all the clinical forms; but nevertheless the general result of the pathological observations on nasal suppuration amounts to this, that it conforms in all respects to the laws of general pathology.

C. SYMPTOMATOLOGY.

I. Secretion.

PURULENT secretion from the nose has a very variable composition. It may be chiefly mucus, glassy, gray, or amber-coloured, mixed with flakes of pus; or it may consist of irregular masses of yellow stringy mucus, with the pus uniformly mixed through it. It may contain but little mucus, and consist of almost pure pus, aggregated into lumps which look almost globular in water, and display a yellow or brownish red colour (from admixture of blood pigment). Finally, it may assume the form of crusts, which may be semi-liquid or quite dry, shell-like, or in solid masses. These consist, as a rule, of pure pus, but sometimes contain such a large admixture of blood that they are either black or dark grayish-green in colour. With regard to smell, the secretion may be quite odourless, or possess the greatest possible variety of smell, or rather stink, as has been most minutely described by various authors.

The consideration of the secretion is not unimportant, inasmuch as the form it assumes sometimes gives us information as to where it comes from. Large quantities of very liquid secretion justify the expectation that it originates in a large cavity. Ball-like lumps, always assuming the same shape, prove (or at least suggest) that they are formed in the same place, although they may be discharged at various times. A tendency to crust formation justifies the assumption that the pus has remained long enough inside the nose to become dried up. No form of suppuration, however, has attracted so much attention amongst surgeons, and excited such lively controversy, as that form which manifests its existence by the

presence of stinking crusts. Cases in which such secretion is present have been dignified with the name **ozæna**, and described as a disease *sui generis*. The importance of this subject demands that it shall receive specially attentive consideration. It is necessary to utter a protest against the prevailing misuse of the expression 'ozæna,' which is applied by many surgeons to every chronic, and especially to every fœtid, nasal secretion, with the addition of various inappropriate adjectives, such as ozæna 'syphilitica,' 'tuberculosa,' 'scrophulosa,' 'genuina,' etc. Particularly objectionable is the expression 'scrofulous ozæna.' All of these various forms of disease have next to nothing in common; frequently not even the coarsest of all symptoms—the bad smell. I have never noticed it in cases of tubercle of the nasal mucous membrane, and in syphilis only in cases where caries, or a sequestrum, was present.

For all these separate diseases we have now very precise designations, founded partly on semeiology, partly on ætiology; and after exclusion of all these, the cases that still remain to be classed as 'ozæna' are much more appropriately named 'fœtid atrophic rhinitis.'

It remains to prove that the group of symptoms included under this last name represents a pathological entity with a constant ætiology. This proof I have not as yet found, either in the literature or in my own experience.

By the name **fœtid atrophic rhinitis** is understood a disease characterized by chronic course, atrophy of the mucous membrane, or even of the bony framework, and the formation of dry stinking crusts—all this without any definite discoverable cause. That this grouping does not include all the cases, however, is shown by the fact that we have to recognise an **atrophic rhinitis without fœtor**, which differs from the other only in the absence of smell; and, again, it is by no means rare in the more frequent forms to find, along with advanced atrophy, parts which are almost hypertrophic. This latter fact has led some to assume that hypertrophy is the primary condition, which by-and-by degenerates into atrophy. Others hold strongly to Voltolini's view, that we have to do with a primary atrophy; while a third set of theorists seek to escape from the dilemma by assuming that in some places the atrophy may be

primary, and in others the hypertrophy; and one author, in advocating this last view, allowed himself to be misled into regarding as hypertrophy the remains of normal tissue in an abnormally wide nose.

In order to preserve the general idea, the picture of a **unilateral ozæna** has also been constructed (by Jurasz and others); and this system of classification, if followed out, must lead to the description of many more subvarieties of ozæna, seeing that no two cases are alike, if we except those that have reached the stage of complete bilateral atrophy.

Too little weight has, I feel sure, been attached to this character of polymorphism; otherwise much more doubt would have been felt as to the unity of the process.

The error which is at the bottom of the confusion in this question is this: these various forms of fœtid and non-fœtid crust formation, imperfectly differentiated as they are, both anatomically and ætiologically, are slumped together as varying expressions of the same morbid process; a view which might perhaps be justified in a single series of cases, but which, applied generally, is only calculated to mislead from the start, in the study of individual cases. Reason enough, surely, for requiring in the first place definite conceptions, in order that criticism may not degenerate into a fighting with shadows.

If, then, I may endeavour to definitely summarize floating opinions, I should say that the disease consists in a peculiar inflammation of the nasal mucous membrane, beginning in childhood, and showing itself, on the one hand, in the formation of purulent crusts, with a quite peculiar fœtor; and on the other hand, in a tissue change which has been distinguished as genuine atrophy. There is, however, no overpowering reason for assuming in advance that the atrophy and the fœtid crust formation own a common cause. The unwarrantable assumption that this was so naturally paved the way for the supposition that the secretion could only originate in the altered mucous membrane. And thus do the blind lead the lame!

Even if we grant that the same essential anatomical changes are produced, that does not justify us in assuming the existence of a peculiar process. To prove that, it would be necessary to show that these constant features were the clinical causes of

the picture presented, and not purely accidental or consecutive appearances.

Thus, the consideration of every single characteristic point, as enumerated by various authors, resolves itself into two questions :

1. Is this sign constant in all cases which come under the above definition ? and
2. Has it been proved that the condition found is the cause of the other symptoms ?

Let us first apply this critical method to the microscopical appearances.

The examination of the mucous membrane in a number of cases gave the following results :

Gottstein (¹²³), in two cases, found fibrous degeneration of the mucous membrane, with partial infiltration and atrophy of the mucous glands and normal epithelium.

E. Fränkel (¹²⁴) dissected six cases, of which, however, three must be excluded as syphilitic or tubercular. In the remaining three he too found a connective-tissue degeneration of the mucous membrane, with partial destruction of the secreting elements.

Krause's (¹²⁵) two cases led him to a somewhat different opinion. According to him, the essential thing is the conversion of the epithelium into squamous cells, and the aggregation of fat molecules and globules in the stroma. Habermann (¹²⁶) examined the mucous membrane in two cases. In one there was no crust formation, but only a discharge of liquid pus, of six months' duration ; in the other no history could be obtained. In neither case was there any atrophy in the nose, so that they have nothing to do with 'ozæna.' That, however, did not prevent the discovery of a 'characteristic' condition in the two cases, namely, the accumulation of fat in the glandular epithelium ; in comparison with which the fibrous degeneration is considered only to indicate 'the reaction caused by the disease in healthy tissues.' Zuckermandl's four cases of 'genuine atrophy' cannot be considered in this discussion, as there is no mention of secretion, and without secretion there is no 'ozæna.'

Schuchardt (¹²⁷) found cicatricial wasting of the mucous membrane, with a horny condition of the epithelium.

Seifert (¹²⁸) considers that the chief characteristic of fœtid atrophic rhinitis is the partial or complete conversion of the cylindrical into squamous epithelium, and hardening and decomposition of the desquamated scales.

B. Fränkel (¹²⁹), on the contrary, though he frequently found this change, yet observed two cases in which the superficial layers were not 'hornified.'

Finally, according to Réthi (¹³⁰), the essential thing about ozæna is the changes in the glands and the fatty degeneration.

'In the multitude of counsellors there is wisdom!' A uniform and characteristic anatomical change is hardly to be expected after this.

What do all these lesions prove in the sense of our second question? Nothing. Even the assertion that this altered mucous membrane may produce an altered secretion (the characteristic fœtid crusts) is nothing but an assertion. Authors have never yet been able to agree as to how it comes about. Whilst E. Fränkel (¹³¹) regards the crusts as produced by abnormal chemical decomposition of the secretion of anatomically altered glandular elements, and denies the presence of a purulent secretion; Zuckerkandl (¹³²) and his followers speak just as positively, and with as little proof, of a chronic purulent nasal catarrh as the cause of the turbinal atrophy.

There is no single microscopical observation to prove that the secretion really comes from the atrophied parts, or to disprove the possibility that it is perhaps only the lodgment of this secretion on the mucous membrane that brings about the changes secondarily; and granted that the glands which still remain in the wasted mucous membrane must form some secretion, there is not the slightest proof that it is in any way an abnormal product. Anatomical proof is here out of the question.

The problem has been approached from the bacteriological side. Löwenberg (¹³³) found the 'microbe de l'ozène'; that is to say, he found a bacterium presenting distinct morphological characters constantly present in all cases of 'ozæna,' and never otherwise, either in the diseased or healthy nose. That is at least a constant condition. But there is no shadow of proof

that this 'cocco-bacillus' causes either the atrophy or the crust formation. The fact that cultures of the organism never have the smell of ozæna still farther reduces its significance; and, in fact, the only conclusion that can be drawn from the experiments with this bacterium is that the crusts form a favourite soil for its growth.

With Hajek's⁽¹³⁴⁾ *Bacillus fatidus ozænæ* we need not concern ourselves, as this author himself has recognised that it has no particular importance as regards the secretion.

Whether the production of the characteristic odour depends upon one or other of those organisms is a point we may gladly leave their discoverers to determine.

Some have sought to find in a peculiar hereditary predisposition a distinctive feature of this disease. As if predisposition alone could make a disease; as if it were not necessary to a harvest to plant the seed, even when the soil has been prepared by predisposition to receive it! We have long known that there is an (at least apparent) predisposition to consumption, but no one has gone so far as to say that this gives us the key to the disease, or that we may apply the knowledge of this fact in diagnosis. In rhinology, however, everything seems to be permissible; all kinds of fallacies have been assumed with regard to ozæna, and have been received with that enthusiasm which interpretations of facts, however false, always elicit, if only the facts appear to have been obtained by exact methods.

But to return to the question of hereditary predisposition. The only evidence of it consists in the fact that frequently several members of the same family—sometimes, indeed, all the members—present the symptoms of ozæna. The advocates of this theory forget to mention the fact that this is quite exceptional. But even if it were so, as a rule, one would not be justified in drawing conclusions as to the unity of the supposed process; it would no doubt be more probable, but certainly not proven.

My own observations, however, prove the exact opposite. In the list given below are five observations on patients who had blood relations subject to the same disease. But in all the cases it was proved, partly in the case of the patients,

partly in the case of their relatives, that the most various forms of focal suppuration—generally empyema—were the cause of the clinical picture of ‘ozæna.’

The second proof was lately essayed by Hopmann. He thinks he has discovered a peculiar type in the construction of the bony framework of the nose in ozæna. Thus, he says: ‘In the subjects of genuine ozæna, the antero-posterior measurement of the septum, in a direction from the point of the nose to the posterior edge of the vomer, is, on an average, considerably shorter than in other persons; and the diameter of the naso-pharynx in the same direction is correspondingly longer.’ In order to establish this proposition, he proved by a large number of measurements that in cases of ‘pure ozæna’ the relative distance from the entrance of the nose to the posterior edge of the vomer on the one hand, and from the posterior edge of the vomer to the back wall of the pharynx on the other hand, must in the first case be less than 71, and in the second case more than 29. In other words, in cases of pure ozæna, taking the whole distance from the entrance of the nose to the posterior wall of the pharynx as 100, the relation of parts was as follows:

In ozæna...	...	{ Septum not over 71.
		{ Naso-pharynx not under 29.
In rhinitis sicca...	...	{ Septum under 77.
		{ Naso-pharynx over 23.
In normal nose	{ Septum over 77.
		{ Naso-pharynx under 23.

Comparative measurements, which I undertook on five patients in whom the nose and naso-pharynx were abnormally wide, showed, as one might expect, that these numbers are not generally applicable, for the proportion of the several parts of the skull in different races is too variable to allow of such a fixed standard of comparison.

Hopmann himself came to see this later, but in his first publication he announced his standard as generally applicable, in the following words: ‘In doubtful cases one may without hesitation exclude genuine ozæna, if the measurements of the septum and naso-pharynx are approximately normal (77 : 23 or more); but, on the other hand, one may with certainty assume

the existence of true ozæna (either past or present) if the relative measurement of the septum is less than 70, and there are no signs of old syphilis' (scars, perforation of septum, etc.). Let us suppose, however, that every observer in his own place had established a standard of comparison by taking measurements of healthy and diseased noses. What then? What the better should we be? We should have a standard of comparison for *antero-posterior* measurements in the cases concerned; whilst hitherto we have been chiefly interested in the abnormal *width* of noses with fœtid crust formation. We know, of course, that abnormal width and abnormal depth frequently go together, but every unbiassed observer must admit that this is not always so, and I took the trouble to demonstrate this in one case. (The naso-pharynx measured 2.9 cm., a most unusual depth, and the septum 6.3 cm.; and the width of the nasal cavity was quite normal.) Such cases are by no means rare. My readers will pardon me if I let one example suffice.

For even if Hopmann, or anybody else, succeeded in discovering a method of measurement which brought out the peculiarities of wide as well as short nasal cavities, I should still regard it as a great mistake to found a diagnosis upon a recognised—still more upon an assumed—predisposition, which at most should form no more than a foundation for a diagnosis. Yet this is what Hopmann claims for his method. We see many wide nasal cavities (Hopmann himself quotes an instance) in which there is not, and never has been, any formation of fœtid crusts (Hopmann goes the length of diagnosing retrospectively a 'once active ozæna'); and on the other hand we see many cases of fœtid crust formation in noses of normal width, or even narrower than usual. So much for the illusory value of anatomical disposition of parts.

If the existence of a genuine or essential atrophy of the nasal mucosa were proved, it would furnish at once an excellent diagnostic feature, and a proof of the presence of a peculiar morbid process. And, in fact, it has been held that the microscopic appearances described above prove the 'essential' nature of the atrophy.

That is a slight mistake. Observers have, it is true, found

atrophy and no other anatomical change, but they have not proved the atrophy to be essential, simply because such proof is, anatomically, impossible. The fact that the most exact anatomical examination of neighbouring organs discovers nothing wrong in them does not by any means justify the conclusion that the atrophy is primary, for the original cause of the disease may vanish, while the secondary atrophy remains as a permanent result. That the cause of the atrophy may frequently disappear is, in my view, very probable, when one bears in mind, for instance, the occurrence of crust formation in cases of adenoids, to which I have already drawn attention (¹³⁶), and the physiological behaviour of these growths in shrivelling up after puberty. On the other hand, this spontaneous disappearance would explain the discovery of an atrophy apparently primary.

The following two cases show very well how one must estimate anatomical proofs of primary atrophy :

CASE 14.

Pronounced Atrophy of the Mucous Membrane of the Throat and Nose with Crust Formation. Cure of the Crust Formation by Removal of Adenoid Growths.

M. S., seamstress, aged 18, has been troubled for a long time by the formation of pus, and especially of crusts, which are closely adherent to the mucous membrane, and are with difficulty got rid of by hawking and blowing the nose.

The middle and lower turbinals are markedly atrophied, and the nasal cavity very wide. Masses of yellowish-gray crusts fill the naso-pharynx, and the right lower meatus contains liquid muco-pus. A mass of adenoid vegetations reaches down, covering the edge of the choanæ, and also the posterior wall and the openings of the Eustachian tubes. The mucous membrane of the posterior wall of the pharynx is wasted, dry, and shiny. The vegetations were removed in two sittings. Four days after the second sitting, secretion completely gone. (Empyema was excluded by careful examination.)

CASE 15.

Marked Atrophy of the Mucous Membrane of the Throat. Abnormally Wide Nose. Post-Nasal Catarrh with Crust Formation. Cure by Removal of Greatly Hypertrophied Tonsils.

T. K., a servant girl of 23, has been troubled since childhood by the formation of tough crusts and yellow mucus, which are hawked up with difficulty from the throat, and never come down the nose. Naso-pharynx and nose are unusually roomy, the mucous membrane smooth and shiny. Tonsils enormously enlarged, meeting in the middle line. The mucous membrane of the posterior pharyngeal wall looks extremely thin, smooth, and shiny, as if varnished, and is covered by a film of dried secretion—the picture of ‘pharyngitis sicca’ of some authors.

Both tonsils were removed.

Two months after the operation. The secretion from the throat vanished at once, the patient says, and none is to be found now either in nose or throat. The mucous membrane of the throat, however, still presents the same appearance of extreme atrophy.

In order to prevent misunderstanding, I wish to state expressly that I do not identify the two last cases with ‘ozæna,’ seeing that there was no odour. They are quoted as throwing light upon the question of genuine or essential atrophy.

In such cases (and who can say how frequent they are?), no farther **anatomical** proof could be adduced; unless one set one’s self to prove, in individual instances, that an atrophic mucosa might have been present at some time or other, and that at a later period crust formation might have taken place upon it, not from any limited area, but from the whole mucous membrane. I do not know of a single case in which this chronological sequence of events has been observed (not assumed), and until then this relationship cannot be considered as proved.

The odour of the crusts has been supposed by some to be peculiar and characteristic. It is true that one often encounters the same kind of smell in the most questionable

cases of fœtid crust formation, yet observers will differ in opinion, and it then becomes a question whether the man with the finer sense of smell, or the one with the greater reputation, (unless the two coincide), is to be considered the decisive authority. On the other hand, it would be somewhat risky to alter the diagnosis simply because one did not find exactly the right kind of stink. I have not found any adherent of this 'characteristic smell' theory prepared to go so far as that. If one allows exceptions, the supporters of the theory of the unity of ozæna are always ready with one when anything does not fit in; it was a notable exception when Réthi⁽¹³⁰⁾ found the characteristic odour of 'genuine ozæna' in two cases of empyema.

If, however, we do not assume the existence of such exceptions, then the similarity of fœtor indicates nothing more than that a similar process of decomposition is taking place. It does not help us at all in judging of the nature of the process of secretion.

Amongst unsuccessful attempts to simplify and reconcile conflicting views must be reckoned Michel's⁽¹³⁷⁾ theory of ozæna, which refers the whole process to disease of the accessory cavities, and more especially of the sphenoidal sinus. He founded this view upon the success of his treatment, which he considered was directed to those cavities.

Having filled the nose with liquid from a ball syringe, he made the patient close the nostrils and bend the head well forward. The retained liquid was then supposed to penetrate and wash out the accessory cavities, especially the sphenoidal and ethmoidal cells. That it does so, however, is by no means proved, although Michel describes an 'occasionally painful sensation in the head above the eyes, and the gradual trickling away of liquid for some time afterwards,' and cites this as proof. The symptoms described are quite as likely to be caused by the retention of liquid in the nasal passages, and between the turbinals and the septum.

The hypothetical character of Michel's assumption becomes still more evident when one considers Neumann's⁽¹³⁸⁾ experiments. Only in two out of eighteen cases did liquid penetrate the antrum of Highmore, unless a counter-opening existed,

because the contained air had not space enough to escape through the ostium maxillare by the side of the liquid. When two openings were present, the air escaped by the one, while the water entered by the other. On the other hand, however, Michel's success in treatment was very remarkable. True, he did not absolutely cure a single case, but he obtained complete disappearance of fœtor, and very great diminution of secretion. His treatment embodies the best-known method of cleaning the nose and all its recesses.

Thus, while we must reject Michel's theory in its entirety, or, rather, on account of its comprehensiveness, he has, nevertheless, rendered a great service in directing attention to this line of investigation, in my opinion a most fruitful one. This service is not at all lessened by the fact that (as Zuckerkandl mentions) Vieussens and Reiningger had already advanced the theory of the identity of ozæna with disease of the accessory cavities; for these authors are too far away from us in time for men of our day to seek inspiration from them in fresh investigations. Michel probably knew nothing about them as pioneers, any more than we ourselves should have done, but for Zuckerkandl's reminiscence.

Although purely theoretical, the views of Vieussens seem to me so interesting in connection with our subject that I cannot refrain from quoting them:

'Pituitosi vero succi in sinibus supra recensitis congesti, vel ad narium cavitatem, vel patentes ad meatus, qui a naribus ad fauces tendunt, amendantur, sique contingat, ut propter nimiam crassitiem, vel nimiam lentorem, vel propter peculiare quoddam nasi, aut prædictorum sinuum conformationis vitium, in iis diutius retineantur, per diutinam, quam inibi contrahunt, moram, solum, quibus imprægnantur, vi fermentescendo putrescunt et narium fœtorem producant.'

Every word of this sentence is so significant that it might be underlined, for the observations and views of the most recent times are in it fully anticipated. Thus, all attempts to prove the unity of the process in ozæna have hitherto failed. And even if such attempts should some day succeed, what the better should we be? Insight into the essence of the supposed process would still be wanting, and this can only be attained

by careful analysis of all the phenomena. Three questions suggest themselves :

1. Where does the secretion come from ?
2. Why is it fœtid ?
3. Why does the fœtid secretion form crusts ?

These three questions cover the whole field. When they are answered, the essential nature of the individual case will be explained ; if they can be answered in the same way for all cases, we shall have possessed ourselves of a definite and permanent clinical picture of the disease ; if not, the idea of the unity of ozæna must be abandoned.

1. Where does the Secretion come from ?

A review of all the theories hitherto advanced as offering a consistent explanation of 'ozæna' and its ætiology discloses the fact that, excepting Michel's, they all start with the assumption that the secretion comes from the whole surface of the mucous membrane. This is quite unproved, but it is none the less confidently assumed.

For instance, the author of a well-known text-book says : 'It does not come from the accessory cavities, and it must come from somewhere ; therefore it comes from the mucous membrane.' It is not given to everyone, however, to assume with such ease and completeness as this, and other authorities have sought for proofs. Of these two have been advanced. First, the observations of Gottstein⁽¹³⁹⁾ and Jurasz⁽¹⁴⁰⁾ on the living subject. On watching closely a surface of mucous membrane which had been carefully cleaned, they noticed that after a little time tiny scattered yellow spots appeared on the surface, so that it looked as if it had been finely dusted with yellow powder ; and then, gradually, the ordinary crust formed. Now, certainly, thought I, this observation must be right ; and if, as one may suppose, the same conditions obtain in other cases of 'ozæna,' I shall be able to confirm the observation. I sought for long in vain, but at last one day I succeeded in observing the phenomenon ; and forthwith wrote down my description and made a drawing in colours :

'On the surface of both lower turbinals little scattered drops

of yellow pus appeared. They could be seen to project from the surface, and between them the mucous membrane was apparently dry. The fœtor was attached to the droplets of pus.'

At last I said to myself: I have found a case in which one can really observe what so many authors have assumed—a suppurating surface, fœtid *ab initio*. Alas! my joy was short-lived. The appearance was never again seen, in spite of weeks of careful observation of the same case; and finally, it turned out that the pus came from the antrum and frontal sinus on both sides. The latter cavities were freely opened, and extensive caries was found. The pus, flowing down in a thin invisible layer from the middle meatus, only became visible as it met inequalities of surface here and there, which checked its uniform flow, and caused it to collect in droplets.

I have, since then, often repeated an observation which shows how easily one may be deceived. At some part of the nasal cavity, generally under the lower turbinal, pus is found to collect, and after wiping out, to collect again, without one being able to make out where it comes from. At last, by frequently wiping the upper surface of the lower turbinated body itself, one finds that the pus was really flowing down over this surface in a layer so thin and uniform as to be invisible. I feel certain that many other observers have been deceived as I was. To make the matter still plainer, let me take a homely illustration. In a familiar kind of urinal we have a smooth vertical slab over which water flows from above downwards. Now, it is quite impossible by simply looking, to get any other impression than that the water exudes from the vertical surface of the slab; the layer of liquid is too thin and uniform for one to see that it is flowing; it seems simply to cover the surface. If this optical illusion is possible on an exposed surface directly facing one, and where one knows exactly what is going on, how much easier must the deception be when, as in the nose, the surface is seen in profile, and when one not only does not know that the liquid is not exuded from the surface, but, on the contrary, believes that it is.

In order to get at the truth, the same means should be adopted in both cases. Turn the water off, or let it only flow by drops, and one sees plainly the holes from which it comes;

plug the nostril up above the moistened surface, the discharge ceases, and it is obvious that nothing exudes from the surface.

The second 'proof' of the surface origin of the secretion in 'ozæna' is a negative one, founded upon anatomical results—upon the fact, namely, that in the majority of cases no focal disease, and especially no empyemata, have been found.

This would be decisive, if it were not that a careful analysis of the original anatomical reports in this matter shows that in most cases the conclusions deducible from them are the exact opposite of those that have actually been drawn, and quoted by writer after writer without knowledge of the original evidence.

In order to make this matter clear, I must ask my readers to follow me in a brief review of the original evidence, as much of it, at least, as was accessible to me.* What I ask of my readers' patience is a small matter as compared with the demands upon my own, necessitated by this comparison of original reports, and the reviews of them.

I. HARTMANN (94).

A woman of 26, dead of phthisis. Since her twelfth year she had been in the habit of expelling through the nose every second day a large shell-shaped crust.

Post-mortem.—Both sphenoidal sinuses very small (the right the size of a pea, the left twice as big), lined with hypertrophic mucous membrane, so that the right cavity was almost obliterated; the left contained yellowish liquid secretion. The other cavities normal. The posterior upper (!) parts of both sinuses filled with thick dirty-greenish, ragged masses with a penetrating odour. This was especially the case above the choanæ, on the roof and lateral walls of the nose, and between and behind the turbinals. After washing the parts, the septum was found covered with tough mucus and thickened fœtid secretion, sticking to the roof of the nose (?) and the region of the Eustachian openings. An ulcer as big as a lentil-seed was situated in front of the right tubal opening.

And this case has actually been quoted repeatedly as yielding a negative result in respect of the accessory cavities!

It has been generally recognised as 'ozæna.' 'In this case the secretion could neither have come from the normal ethmoidal

* The reports of Zaufal and Gottstein are not accessible to me.

cells nor from the very small sphenoidal sinuses,' says Hartmann. But why not from the latter? Because they were too small for the amount of the secretion? That is not in accordance with our present experience in the living subject; and in this patient, according to the history, the expulsion of crusts only took place every two days; time enough, surely, even for small actively-secreting cavities to furnish a considerable quantity. (The mucous membrane was very much swollen.)

Again, the presence of liquid pus in the left sinus, and dry crusts in the nose, is very significant; secretion is liquid at the place where it is formed, and does not dry into crusts till it is deposited or lodged somewhere. I think there is no doubt that the secretion which was found in the upper and back part of the nose came in this case from the sphenoidal sinuses.

2. KRAUSE (125).

A man of 52, dead of cirrhosis of the liver. No history. Mucous membrane of the nose, of the sphenoidal sinuses, and the maxillary antra, grayish-red and thin. Middle and lower turbinals small. Mucous membrane of naso-pharynx and tubal ostia swollen and brawny. In the lower and middle meatus, foetid, discoloured, grayish-brown masses of thickened secretion.

Microscopic sections were prepared from the right side. Antrum: 'no epithelium remaining.' Finely fibrous ground substance, much brown pigment. 'Certainly a comparatively slight affection.' Sphenoidal sinus: epithelium wanting, slight infiltration. Pigment. 'Upon the whole a slight affection.'

The ethmoidal cells are not even mentioned!

A second post-mortem by the same author:

A woman of 40. Ozæna of many years' standing. Death from chronic interstitial nephritis. Tuberculosis. Mucous membrane of the nose and accessory cavities reddened. Sections were made of the mucous membrane of the antrum, and of the frontal and sphenoidal sinuses, but the ethmoidal cells were completely overlooked.

It is impossible to say where the secretion came from in these two cases, but focal disease cannot be excluded. The microscopic sections correspond exactly with Zuckerkandl's picture of chronic inflammation of the mucous membrane of the accessory sinuses, and in any case a report cannot be con-

sidered complete which leaves out of consideration a number of the most important foci, such as the ethmoidal cells and the pharyngeal tonsil.

3. EUGEN FRÄNKEL (¹²⁴ and ¹³¹).

First Case.—A man of 30, dead of phthisis. Had suffered long from fœtid nasal discharge, but whether the secretion was in the form of crusts is not mentioned. 'Both halves of the nasal cavity, as well as the open antrum (?), are full of tough yellow mucus. In the interior of both sphenoidal sinuses is a 'cream-like discoloured liquid, and the cavities are lined with a succulent, dirty, grayish-coloured membrane,' 2 to 3 mm. in thickness.

Second Case.—A young woman of 30. Marked saddle nose, intense fœtor. Post-mortem, a gumma was found in the liver; there was gummatous ulceration of the skull. The nasal septum was almost entirely destroyed, and there was loss of substance in the middle and lower turbinals—in fact, a high degree of syphilitic ulceration of the nose.

Third Case.—A man of 39. 'A most sickening fœtor from the nose.' Death from uræmia. Phthisis. Ulceration of the sphenoid and of both petrous temporals, and molecular necrosis of the vomer of tuberculous nature.

Fourth Case.—A woman of 68. Death from apoplexy. Sieve-like destruction of the sphenoid. Necrosis of the petrous temporal. Loss of almost the whole of the cartilaginous septum. Ulceration of the vomer. Ulcerative syphilis of the nose.

Fifth Case.—A man of 45. 'Suffered for years from fœtor.' Death from phthisis. A very wide nasal cavity; mucous membrane strikingly thin. Accessory cavities roomy, lined with pale mucous membrane, quite intact. The mucous membrane of the turbinals and septum on both sides covered with dirty greenish secretion, closely adherent. Sections of the mucous membrane from the right side of the septum showed the epithelium to be intact; the glandular elements either entirely absent, or represented only by occasional tubules, surrounded by groups of lymphoid cells. Sections from the respiratory region of the nose show, on the other hand, a relative abundance of grape-like glands, the wide ducts of which (often filled with glassy translucent material) can be traced to the surface of the mucous membrane. The condition of the naso-pharynx is not mentioned.

Sixth Case.—A man of 28. Fœtid discharge from the nose from youth up. Death from pernicious anæmia. Both nasal cavities very wide; lower turbinals very greatly atrophied.

Mucous membrane of the left sphenoidal sinus somewhat œdematous. In both nostrils masses of discoloured fœtid secretion, not crusted. Sections of the mucous membrane of the olfactory region show 'almost complete disappearance of the glandular elements,' whilst in the respiratory region acinous glands are visible in considerable numbers. No mention of the naso-pharynx.

Now, of these six cases, three, viz.,—Nos. 2, 3, and 4—may be excluded to start with, as the process was one of specific ulceration, having nothing to do with 'true ozæna.' That, however, has not prevented them from being repeatedly quoted and used (without criticism) in the discussion of this question.

Where does the secretion come from in the other cases? In Case 1—if one is not biassed by preconceived views—the answer seems clear enough; I, at least, have never yet seen pus from the nasal cavity flow into the accessory sinuses, but always the other way about.

The explanation of Cases 5 and 6 is more difficult. Yet it seems to me certain that secretion could not come from parts in which glands were almost or quite absent, and epithelium intact. Secretion must either come from a granulating surface, from which, of course, epithelium is absent, or it must come from a mucous membrane; that is to say, from the secreting parts of it—to wit, the glands. Where glands are absent there is no secretion. *Tertium non datur.*

Thus the 'atrophic' mucous membrane cannot have furnished the secretion. Where else in these two cases it came from I do not know.

One cannot attach much importance to the œdematous state of the mucous membrane of one sphenoidal sinus in Case 6. Whether the pus originated in one of the meatūs of the nose (as occasionally happens in ozæna), or in one of the recesses of the throat, cannot, in the absence of any report on those regions, be determined, any more than the opposite eventuality can be excluded. The question must remain open, and the two cases prove nothing either for or against the theory of surface suppuration.

To proceed :

4. ZUCKERKANDL (37).

The cases bearing on the subject are not separately treated; one must pick them out of the series which refers to 'inflammatory diseases of the accessory cavities.' If my selection does not always correspond exactly with the author's intention, that can hardly be reckoned my fault, for I have taken a great deal of trouble in trying to follow him exactly.

Case 19.—Chronic catarrh, combined with atrophy of the turbinals. Turbinated bodies atrophic. Mucous membrane of nose thin and wasted, but yet at some points rather hypertrophic, with the openings of the glands dilated, *e.g.*, at the edges of the infundibulum (hiatus semilunaris). Mucous membrane of the right antrum apparently normal, that of the left somewhat swollen and showing cysts.

Case 20.—Atrophic rhinitis. Turbinated bodies and mucous membrane atrophic. In the nasal cavity a stinking, greenish-yellow, thickish mass.

Case 22.—Atrophic rhinitis. The middle turbinals atrophic. The mucous membrane of the antra swollen and covered with pus.

Case 30.—Chronic catarrh with atrophy of the turbinals. The spongy bones reduced in size by atrophy. The mucous membrane on the free edge of the (inferior?) spongy bone hangs down into, and fills the lower meatus, with a thin, flaccid, polypoid-looking mass. The right sphenoidal sinus is full of fœtid mucus.

As far as one can see, we have here to do with acknowledged disease of the accessory cavities, in three out of four cases (*viz.*, 19, 22, and 30); and the remark already made holds good for these, *viz.*, that their secretion is always to be found in the nose, but the nasal secretion never finds its way into them. Case 20 appears to be identical with the one mentioned on p. 243, in which the accessory cavities were normal.

Regarding other well-known seats of suppuration, especially in the naso-pharynx, nothing is here said, so that they cannot be excluded. Of all Zuckerkandl's cases not one proves the origin of the secretion from the general surface of the mucous membrane.

Next in order come the dissections of Harke, who, as he

modestly puts it, obtained 'only negative results with regard to ozæna.' Let us see.

Case 143.—Death from phthisis. No suspicion of syphilis. Had typhoid. Large loss of substance in anterior part of septum. In anterior half of nasal cavity, dark-green, stinking, greasy masses. Moderate atrophy of turbinals. Mucous membrane thinned and discoloured. Green pus in the right anterior ethmoidal cells.

Case 201.—Death from phthisis. Stinking masses in the nose. Mucous membrane generally, thin and granular. Atrophy of turbinals. Accessory sinuses not diseased. (Pharyngeal tonsil (?) not mentioned at all.)

Case 229.—Death from typhoid. Greenish-yellow, stinking, greasy masses in the nose and naso-pharynx. Atrophy of turbinals. Sphenoidal sinuses full of yellowish-green pus; lining membrane blood-red and swollen.

Case 264.—Death from pneumonia. Greenish, stinking, greasy masses in the nose. Atrophy of turbinals; mucous membrane covering them pale and granular. Hypertrophic mucous membrane on uncinatè process of both sides. Mucous membrane of antra and sphenoidal sinuses moderately swollen and much reddened. In the first-named cavities 3 to 4 c.c. of somewhat turbid serous exudation. 'The inflammatory changes in the accessory cavities were evidently (!) due to the pneumonia.'

Case 367.—Death from phthisis. A quantity of thick, green, stinking discharge in the nose and naso-pharynx. Mucous membrane generally atrophic, granulated. Atrophy of turbinals. On the septum, opposite the left middle turbinal, a localized hypertrophy of the mucous membrane as big as a pea. At the anterior end of the left middle turbinal, and on the right hiatus semilunaris, polypoid hypertrophies. On the floor of the left antrum, thickened mucous membrane, with small cysts containing gelatinous and muco-purulent matter. In the right antrum, enormous gelatinous swelling of the mucous membrane, but no free exudation.

Case 276.—Death from ileus. Mucous membrane pale and granulated. No exudation, marked turbinal atrophy. In the left antrum, mucous membrane permanently swollen, pale, and thickly studded with cysts containing mucus and muco-pus. A case of 'atrophic rhinitis without fœtor,' as it is called.

Thus, apart from this last case, we have here five cases of 'ozæna,' of which four show diseases of the accessory cavities, diseases which are quite sufficient, according to clinical experi-

ence, to produce the masses of fœtid secretion which were found post-mortem.

The objection that—for instance, in Case 367—no secretion was found in the antrum, in spite of very great changes in the mucous membrane, and similarly in Case 19 of Zuckerkandl's, touches a weak point in these, as in all anatomical observations, viz., that they can only embody a single or, as one might say, a one-time observation; whereas on the living subject **disease processes** can be observed. As regards the question under discussion, however, clinical observation teaches us that diseased accessory cavities may be at one time quite empty, whilst at another time they contain pus, etc.

Suchannek ⁽⁹²⁾ gives a short note of three dissections, in two of which he found no disease of the accessory cavities. Of other seats of disease he says nothing. The note is too short to help us here.

Let us now review the results of these dissections of fifteen cases of 'ozæna,' and one of atrophy without fœtor. Amongst the sixteen cases, disease of the accessory cavities was proved to exist in eleven. (Hartmann, one; Krause, one; Fränkel, one; Zuckerkandl, Cases 19, 22, and 30; Harke, Cases 143, 229, 264, 276, and 367.) As regards the remaining five cases, in some of them the condition of important accessory cavities is not mentioned at all (Krause's cases); in others, information as to the condition of other parts is wanting (Krause, 5 and 6; E. Fränkel's case; Case 20 of Zuckerkandl's; Case 201 of Harke)—parts, disease of which is capable of producing the clinical picture of ozæna.

Thus, the anatomical proof that the secretion in ozæna comes from the general surface fails completely.

At the best, such proof could only be of a negative kind. In some cases, localized disease has been directly demonstrated in 'ozæna'; in others, it has not been possible to exclude it as a possibility. This, however, does not solve the question of the origin of the secretion; anatomical investigations have so frequently shown extensive changes in the nasal mucous membrane itself that some have maintained the view that the secretion comes, chiefly at any rate, from the general surface, and that the accessory cavities (and I may add other seats of

disease) only become affected secondarily. That is an opinion which is entirely theoretical, and incapable of anatomical proof; but it is also incapable of refutation upon anatomical grounds. Only the observation of morbid processes in the living body can help us here. If the secretion of the nasal mucosa be the essential thing, then the treatment of any localized conditions which may be found to exist will not materially change the clinical picture; but if, on the other hand, the focal disease be the essential thing, and the nasal mucosa only secondarily affected, then the cure of the focal disease ought to suffice to free the nose from all morbid secretion, and cause the symptoms of 'ozæna' to disappear. That is the only possible proof, and can only be furnished *in vivo*. That proof has now been furnished.

Schäffer (⁸¹) was the first to cure 'ozæna' by treatment of the accessory cavities, and thus to prove the ætiological connection in his case.

He reports thus: 'Case 34.—A young woman of 26; had suffered for years from "ozæna." The signs pointed to suppuration, chiefly of the sphenoidal sinuses. I opened first the left sinus, and, a year later, the right, with complete success. The patient was entirely cured of her troublesome disease in two years.'

That is the first precise, though unfortunately very brief announcement, of the origin of 'ozæna' from disease of the accessory cavities. It is at the same time the first case exactly reported of cure of this disease.

It is to be regretted that Schäffer himself did not realize the far-reaching importance of his own communication, which ought even then to have stimulated to more searching investigation. Nevertheless, the attention of those who concerned themselves with diseases of the accessory cavities gradually of itself turned more and more to the connection of these diseases with 'ozæna.'

I myself continued the proof in a series of cases, removing entirely the fœtid crust formation, by treatment exclusively directed to the diseased accessory cavities.

I proved, farther, that the secretion does not always come from the accessory cavities, and that other focal lesions are capable

of producing exactly the same appearances, more especially diseases of the lymphatic ring of Waldeyer (two cases of 'ozæna' from suppuration of the pharyngeal tonsil; two cases of non-fœtid crust formation and atrophy from suppuration in the pharyngeal and faucial tonsils).

Exempla trahunt: Bresgen (⁹²) published a whole series of cases, in which, diseases of the accessory cavities having been found, treatment directed exclusively to them removed the secretion.

Lately I had the opportunity of increasing the number of recorded cases in which 'ozæna' had been produced by disease of the accessory cavities; and in one case I was able to prove that localized suppuration, even in a single meatus of the nose, may be sufficient to produce the clinical picture of 'ozæna.'

Taking all the cases I have had during the last five years, or rather more, I have not found a single one without focal suppuration. I have not been able in every case to furnish strict proof that the secretion proceeded exclusively from these focal suppurations, for I have not myself treated all the cases, and those I have treated, I have not always been able to follow to complete cure.

In all the cases treated, however, even those which could not be considered as cured, appropriate treatment of the local condition produced an immediate change in the secretion, nearly always an immediate disappearance of the fœtor, and this at any rate is sufficient to prove the comparatively unessential nature of the other conditions present. I give below a short account of my observations.

Unless specially noted, the cases were characterized by the formation of stinking crusts in very wide nasal cavities, the affection dating back to childhood. Cure means permanent removal of fœtor and secretion:

1. The case is minutely reported below, p. 69.
2. A man of 31. Empyema of all the accessory cavities on the right side. The fœtid crust formation was removed, but suppuration continued in the right frontal sinus, and the patient could not make up his mind to submit to farther treatment. Hence it is possible there might be a return of fœtor.
3. A man of 28. Fœtid crust formation for six years. Perfect cure followed treatment of necrosis in the left sphenoidal sinus.

4. A man of 37. Empyema of both frontal sinuses. Operation removed fœtor and crust formation. As the patient—content with his condition—withdrew from treatment before the suppuration was quite cured, a return of the symptoms is possible.

5. A man of 30. Nose clean. Sphenoidal sinuses visible; both contain liquid pus, which, however, quickly dries into crusts on the anterior wall. Not treated.

6. A lady of 36. Empyema of all the accessory cavities on both sides. Operation. Liquid secretion without a trace of odour still comes from the frontal sinuses, their final cure being prevented by external reasons.

7. A girl of 17. Suppurating recesses in the pharyngeal tonsil. Removal. Cure.

8. A girl of 14. Adenoids. Extirpation removed the odour and the crust formation. The remaining odourless and liquid secretion perhaps came from the sphenoidal sinuses. Evadit.

9. A girl of 18. Adenoids. Non-fœtid, but copious crust formation. Extirpation. Cure.

10. A girl of 23. Non-fœtid crust formation in nasopharynx. Very large tonsils. Removal. Cure.

11. A woman of 34. Empyema of the middle ethmoidal cells and the antrum, on both sides. After exposure of the ethmoidal cells, permanent disappearance of odour, notwithstanding the fact that the antra were not opened till three weeks later. After three months' treatment, secretion trifling, liquid and odourless. Patient withdrew from observation.

12. A woman of 44. A very wide nose. Marked atrophy of the lower turbinals. Slight fœtid secretion forming soft crusts. Empyema of middle ethmoidal cells and both sphenoidal sinuses, of six years' standing. Operation. Cure.

13. A man of 24. For the last three or four years crust formation, occasionally fœtid. Marked atrophy of middle turbinals. Empyema of both antra. Operation. Improvement. Still under treatment.

14. A man of 22. (His mother and brother both suffer from the formation of stinking crusts in the nose.) Lately the fœtor has only been occasional; formerly it was constant. Empyema of middle ethmoidal cells on both sides. Polypus on the ethmoid, and in the right sphenoidal sinus. Operation. Cure.

15. A girl of 14. Pronounced 'ozæna.' Empyema of posterior ethmoidal cells and sphenoidal sinuses on both sides. Operation. Ten or eleven months afterwards there was very slight odourless secretion, but no crust formation.

16. A girl of 16. Intensely fœtid crust formation of a year's duration. Very wide nose. Empyema of both antra.

Adenoids. Operation. Smell gone. Secretion trifling, liquid, rarely yellow. Still under treatment.

17. A man of 32. A sister died of chronic nasal suppuration. Circumscribed suppuration in left middle meatus. Caries of lamina cribrosa. Removal of left middle turbinal. Suppuration ceased. Not seen since.

18. A man of 26. Professor Gottstein observed this case with me. His diagnosis was, 'Fœtid atrophic rhinitis.' The crusts became fœtid if the patient omitted his nasal wash for one or two days. I made out empyema of the middle ethmoidal cells on both sides. Removal of left middle turbinal was not quite complete, as I had no suitable instruments by me. About one year later Professor Gottstein told me that the fœtor was gone, notwithstanding the fact that the nose was neither being washed out nor plugged. The crusts came away more easily. Whether this change was due to the operation, Professor Gottstein very much doubted, because only one side was done. I only record the change that has taken place, and this, according to my experience, is by no means unusual, even after only one side has been operated upon. (See Case 24.)

19. Sister of the last patient. The same symptoms. Suppuration in the left, most posterior ethmoidal cell. No treatment.

20. A man of 52. For the last six or seven years has had crust formation without fœtor; before that time the crusts were always fœtid. His father, brothers, and sisters suffered in the same way. Nose very wide; turbinal atrophy; both middle turbinals reduplicated, in spite of the small size. Bilateral empyema of posterior ethmoidal cells. Operation. Cure.

21. A girl of 20. A flattened layer of adenoid vegetations. After their removal the odour disappeared at once; the secretion diminished, and became more liquid. Further removal of some remains of the adenoids was followed by complete cessation of discharge, and cure.

22. The mother of the last-mentioned patient. Forty-seven years old. A flattened layer of adenoids. The nose is extraordinarily wide, and a pale uneven swelling, composed of soft friable tissue, grows from the lower lip of the right hiatus semi-lunaris. There is a large excavation in the right ethmoidal labyrinth. After removal of the adenoid cushion the fœtor diminished enormously; after free exposure of the ethmoidal cavity it disappeared, and only a slight liquid secretion remained.

23. The daughter of the preceding patient. Thirteen years old. No atrophy; fœtid suppuration, but no crusts. Ethmoidal empyema on both sides. Not treated.

24. A man of 22 years. 'Reduplication' of left middle turbinal in an otherwise highly atrophic and wide roomy nose. Pus wells out of the left upper meatus, and rough bare bone can be felt at the anterior part of it—circumscribed suppuration of the meatus. Exposure of this focus by taking away the anterior part of the middle turbinal removed the fœtor at once. Crusts still formed in the right nostril, but in diminished quantity. With the probe introduced from the front, one could now feel a soft flat adenoid cushion on the right side of the posterior pharyngeal wall, and from this the pus came. In the post-nasal mirror this cushion appeared only as a slight inequality, yet Gottstein's curette removed a firm mass bigger than a hazel-nut. After that all symptoms disappeared, with the exception of a little secretion from the wound in the left middle turbinal. Cure.

25. A woman of 20. Empyema of the posterior ethmoidal cells on the right side was made out at once. On the left side atrophy was so advanced that only a trace of the middle turbinal was left. Inside this friable remnant the probe passed through a narrow ostium into a rough-walled suppurating cavity almost as big as a nut: empyema in the central part of the left ethmoid. After removal of the right middle turbinal the odour became hardly noticeable, but clinging more to the crusts from the left nostril. Two days later the cavity on the left side was freely opened. After that the fœtor disappeared permanently, although free discharge and crust formation continued. This was explained by finding masses of muco-pus in the right antrum, after several fruitless punctures. The antrum was opened from the canine fossa, and the discharge soon became slight. Still under treatment.

We have thus ten cases in which treatment of the local diseased condition removed the discharge entirely; nine cases in which a similar proceeding caused the fœtor to disappear, and greatly diminished the discharge, changing its character from crust masses to liquid pus; and for these cases I consider the proof of the focal origin of the discharge to be complete.

Case No. 18 I will leave undecided, as I did not see enough of it. The same remark applies to Cases 17 and 13. However, even in these three cases localized suppurative disease was demonstrated, and this is also true of the untreated cases Nos. 5, 19, and 23.

The crucial question, however, is this: Are these localized

or focal diseases the only source of discharge, or are they, as Zuckerkandl thinks, only secondary events in the course of a disease which affects the whole mucosa? If the latter view is correct, the discharge ought to continue as before, after the localized disease is cured. This was not so in nineteen of my twenty-three cases, thus proving that in these nineteen cases (which conformed entirely to the conception of 'ozæna') the mucous membrane outside the parts under treatment had nothing to do with the discharge. To speak of the conception of 'ozæna' is, perhaps, to use a euphemism; I mean cases of fœtid crust formation in wide nasal cavities, existing since childhood. If we consider, in addition, that in the remaining six cases the proof was as strong as it was possible for it to be under the circumstances, I think I may claim to have demonstrated, at least for my own material, that the localized diseases were not accidental, but, on the contrary, the essential morbid condition.

This view can only obtain general acceptance, when the same relation has been proved to exist by other observers in other cases—*in vivo*.

This will demand an impartial and critical examination and consideration of all cases which present the signs indicated above.

Bresgen⁽⁹²⁾ is my only predecessor in this line of investigation, and he obtained exactly similar results. Réthi⁽¹³⁰⁾, on the other hand, only found two cases of empyema amongst sixty-four cases of 'ozæna.'

The difference is wide, and one might be tempted to assume difference in material as explaining it—a broken reed upon which I would rather not lean. On the other hand, it seems to me that recent investigations are affected by the same source of error which formerly made it difficult to show reason for altering the then prevailing opinions. That is the difficulty, frequently very great, of recognising the existence of focal disease in the living body. For instance, when B. Hopmann maintains that anyone may easily convince himself of the existence of such disease, that is, to my mind, the very best proof that such cases escape the notice of many observers to-day, just as they did a few years ago, when they were

regarded as clinical curiosities of the rarest sort ; and I do not believe this assumption does anyone injustice.

Professor Gottstein, in writing to me, remarks that although he holds fast to the idea of a genuine ' atrophic rhinitis,' nevertheless fœtid nasal diseases in consequence of affections of the accessory cavities occur much more frequently than we have been in the habit of assuming.

Perhaps I shall make my readers still more dubious when I add that I myself, in the course of the last two years, have twice vainly treated patients for pain about the head and neck, and only discovered the presence of fœtid empyema of the antrum a year later, when they came back to me. Lest it should be thought that this oversight was due entirely to my own lack of experience and skill, I may add that both cases had previously been for a considerable time under the observation of one of our foremost specialists in this department, without being recognised.

To make mistakes is human ; to mend them it is necessary to confess them to one's self, and that is no discredit even to the experienced. (Progress in knowledge is only possible over the ruins of old beliefs.) For example, when B. Bresgen wrote in 1891 : ' I have not yet had the opportunity of observing involvement of the accessory cavities in this form,' and three years later came to the conclusion that he had been mistaken, one's only feeling is that of respect for such an honest striving after knowledge.

As showing the extraordinary difficulties to be encountered in many cases, I recommend to the reader the following history, which is not by any means unique as regards complications, in my experience. I have sometimes spent several weeks in completing my diagnosis.

CASE 41.

'Ozæna' cured by the Treatment of Several Empyemata of the Accessory Cavities.

This was my first case, and concerned a lady of 37, whom I entered in my journal in September, 1890, as a case of 'ozæna.'

She had suffered since childhood from nasal suppuration, which for the last four of five years had assumed a fœtid

character. There was a formation of soft crusts, which could only be got rid of by washing out; after their removal the nose was free from smell. Subjective anosmia was present. Some of the crusts got into the throat, especially in the morning, and were only got rid of after troublesome retching. The head always felt dull and stupid, but there was no special pain. The throat felt very dry.

Examination showed the lower meatus to be very wide (from atrophy of the lower turbinals), and covered with masses of crusted pus, especially in the left nostril. Both middle turbinals shortened, but much thickened, and touching the septum on both sides. The left one was so expanded inferiorly that it filled the lower meatus almost completely about the middle of the nose, practically abolishing nasal breathing on that side. The mucous membrane was of a pale rose colour, in parts finely granular and in parts showing lobulated flap-like outgrowths, and withal extremely soft and friable (rotten), so that the probe penetrated it with very slight pressure, and it bled at a touch. In the choanæ the picture was almost normal, only that all the structures, including the middle turbinals, were atrophic. The posterior pharyngeal wall was covered with a thin layer of yellow varnish-like secretion, beneath which the pale atrophic mucous membrane could be seen.

After removal of crusts from the nose, liquid pus could be distinctly seen on both sides, appearing between the middle turbinal and the septum, and on the left side also from the upper and outer part of the middle turbinal. The enlarged anterior end of the left middle turbinal was removed with the hot snare. Suppuration continued just the same, but became after Christmas increasingly foetid. The swelling grew again. The probe passed through the very thin spongy bone into a cavity from which stinking muco-pus continually welled out. This cavity, which was formed by a bony cyst of the middle turbinal, was next freely opened, and the suppuration from that source dried up, but things continued elsewhere as before.

Next, the whole of the anterior half of the middle turbinal, which was carious through and through, was removed with forceps (the exact *modus operandi* I will describe later), when it was found that there was in addition caries and empyema of the upper anterior ethmoidal cells close under the frontal sinus. The parts were scraped out and plugged; the discharge diminished, but did not cease. At the spot where the middle turbinal had touched the septum, and which was now exposed, a rough-walled perforation was found, which in the right nostril was still covered by the middle turbinal. Re-examination with the probe showed an extension of suppuration above

the remains of the left middle turbinal, from every part of which pus exuded; so the remaining part of the spongy bone was also removed. Nevertheless, suppuration continued, and its origin could be distinctly traced to the outer wall of the left nostril at the hiatus semilunaris. And, in fact, an exploratory puncture showed pus in the antrum.

On May 22, 1891, I opened the antrum from the canine fossa, under an anæsthetic. Frightfully fœtid cheesy pus was evacuated; the walls, which were covered with granulations, were scraped, and the cavity was plugged with iodoform gauze. During the next four or five days suppuration ceased completely, then slight crust formation began in the nose, while the antrum remained quite empty and dry. However, suppuration began afresh, and it became evident that it proceeded from the sphenoidal sinus, and from a cavity as big as a hazel-nut in the most anterior ethmoidal cells. This cavity extended upwards to the orbit, and anteriorly almost to the root of the nose. In consequence of infection from this cavity the antrum began again to secrete fœtid pus as soon as the plug was loosened.

If I were to record all the details of the lesions that were found and their further treatment, this report would be twice as long; let it suffice to say that I removed everything, both bone and soft parts, which, by presenting inequalities of surface, could favour the retention of pus. I opened very freely the sphenoidal sinus and the cavity described above, and after superficial healing of the wounds I removed the plug from the antrum (hitherto changed every few days), inserted a drainage-tube, and ordered washing out.

The patient remained away for a long time, and then came back with a return of fœtid discharge, from which she had long been free.

The antrum had been reinfected, but under treatment (see below) soon became dry again.

In May, 1892, she came up for inspection, and the antrum was dry. (She washed it out every few days as a precaution.) In the nose there were still a few masses of pus, thin, partly liquid, partly dried, and devoid of all smell. These the patient had no difficulty in removing daily by means of a nasal wash; it was evident that they came from places where the bone was still unhealed, at the lower edge of the ostium maxillare and in the sphenoidal sinus. The nose was always free for breathing purposes; there was no secretion from the throat, nor troublesome dryness, and all fœtor was gone. The head was free, and the general condition much improved, so that the patient, who was formerly a very slender person, had become quite plump.

So far I was able to report, but the case was not yet finished. A few months later the patient complained that the fœtor had returned, and that crusts just like the old ones were occasionally discharged from the posterior nares. I examined the nose at least ten times, at longish intervals, without finding the slightest trace of fœtor, either in the expired air or in the thin and scanty secretion of pus, and I was beginning to think that the lady's complaints must be due to a perverted sense of smell, or else that the case was as great a riddle as 'genuine ozæna.'

At last, one day I noticed on the left side of the septum a little loosely adherent mass of pus, not connected either above or below, apparently, with any suspicious spot. On applying the probe, it touched rough bone; on applying pressure, the instrument broke through, and entered a cavity inside the right middle spongy bone which I had quite overlooked, as there had been no discharge for a long time from that nostril. This cavity proved, indeed, to contain the long-sought collection of fœtid pus. It was freely opened, and from that time (now two years ago) the fœtor and the recurring crust formation vanished. The anterior part of the left sphenoidal sinus continued to secrete a little liquid pus, perfectly odourless, but the patient, who was formerly willing to submit to anything to get rid of the fœtor, now declares herself cured, and will take no steps to hasten the cure of this part.

To sum up all the foregoing facts and considerations, we may say that:

1. Discharge from the general surface of the nasal mucosa in ozæna is as yet nowhere proved.
2. On the contrary, the origin of the discharge from localized or focal diseases has for a large series of cases been certainly proved, and for another series rendered extremely probable.

2. Why is the Secretion Fœtid?

The fœtor has puzzled rhinologists more than anything else. This symptom has given a name to the 'disease,' and is considered by many to be characteristic.

Those authors who attach such exclusive importance to the fœtor, overlook the significance of other signs; it does not do to leave the atrophy and the crust formation out of account. The weakness of evidence resting on this single symptom is seen when one asks the question, What would smell if there

were no secretion? Certainly the fœtor has nothing to do with the production of the secretion.

I will limit myself here to what I have certainly found in my own cases.

The simplest solution of this question may be put as follows: **Those circumstances, removal of which is found by repeated observation and experiment to do away with the fœtor, may reasonably be supposed to cause it.** Now, the 'circumstances' referred to are various. In a number of recorded cases the fœtor disappeared entirely as soon as there was free drainage for the pus (Cases 1, 2, 6, 11, 12, 15, 18, 22, 24, 25), so that in such cases the assumption is justified that the fœtor was due to decomposition, caused by retention of discharge inside the cavities, or in their ducts.

In two cases (Nos. 8 and 21) the fœtor disappeared from the discharge after removal of adenoid vegetations. Having observed on several occasions that secretion flowing backwards at the upper edge of the choanæ was, as it were, dammed back by the enlarged pharyngeal tonsil, I can only regard the influence of 'adenoids' upon the fœtor as due to their causing retention of discharge, which in consequence undergoes decomposition. In one case (3) the fœtor was undoubtedly due to a sequestrum, removal of which cured it.

Finally, in three cases fœtor always reappeared with the formation of crusts, which began to develop from the residual secretion that had not been removed.

These cases form a contrast to others in which crust formation persisted for a considerable time—in fact, till the case was cured—but was always odourless.

In all three cases the fresh liquid secretion, as it could be obtained at the openings of the sinuses, was odourless. It first became fœtid in the nose.

In both sets of cases—the fœtid and the odourless—the secretion was deposited on the floor of the nose, where it formed crusts, but in the fœtid cases it lay there so much longer that decomposition was sure to take place. In proof of this I may mention that in all the non-fœtid cases the patients were able—at least after the first operation—to blow the crusts out of the nostril quickly and easily as soon as they formed,

whereas in the three fœtid cases the secretion stagnated in the roomy lower meatus, and could only be expelled with the greatest difficulty. Thus, mechanical conditions are sufficient to explain the three cases I have mentioned. (Here, too, Hopmann's view holds good in so far as the anatomical relations favour the formation of crusts from liquid secretion.)

If bacteriological observations (as far as they have gone) can still be considered as claiming our interest in this connection, it must on the other hand be remembered that the inodorousness of the fresh secretion indicates with certainty that at most we may have to do with saprophytic processes of decomposition, but that any specific influence of any particular bacterium upon the genesis of the secretory process is negatived by these very observations.

We must next consider the significance of fœtor in those cases of nasal suppuration which do not conform to the type of fœtid atrophic rhinitis; for all the considerations mentioned above are insufficient to separate a specific 'ozænic' process from other fœtid nasal suppurations.

As causes of the fœtor, we have here either putrefactive processes at the place where the secretion is formed, due, for instance, to necrosis of bone or soft parts, or to the presence of a foreign body (such as I consider carious teeth in empyema of the antrum), or we have putrescence of previously non-fœtid pus inside the affected cavity.

I have several times observed such putrescence due to stagnation, in empyema of the antrum, and also a few times in the sphenoidal sinus; the secretion that was got rid of by blowing the nose was almost or quite odourless, at most occasionally fœtid, while the pus that was lodged inside the cavities at their lower part stank horribly.

Finally, I observed in two cases the same mechanical conditions which cause a continuance of fœtor in some cases of ozæna. Both were cases of multiple empyema of some years' duration, with the formation of fœtid crusts. The nasal cavities were not wide, but in both cases the lower meatus was very roomy, in consequence of the floor of the nose being deeply hollowed out. As long as discharge lasted, the secretion stagnated in these hollows and formed fœtid crusts.

Thus, as might have been foreseen, the causes of the fœtor in those cases of focal suppuration which present the clinical picture of 'ozæna,' are identical with the causes which produce it in other fœtid nasal suppurations. I do not even except the syphilitic.

Where syphilitic secretion stinks, as it very often does, one may be certain that one has to do not only with a secondary atrophy—a completed process—but that there is necrotic tissue in the nose or its accessory sinuses. It is needless to multiply examples—every rhinologist has, probably, material enough and to spare—but I wish to emphasize the fact that I have never yet seen a case of fœtid crust formation, persisting after the healing of syphilitic ulceration of the nose, in which this proposition could not be proved by the fœtor yielding after removal of sequestra or scraping out decayed bone, even if crust formation still continued as before.

It is worth while to insist upon this point, for cases of so-called syphilitic ozæna are continually being tormented with specific cures and nasal douches, of course without the slightest benefit, till at last they come into the hands of someone who uses the probe, as ought to have been done long before* (not to mention simple ocular inspection, which is often quite sufficient). The true cause of the fœtor is then easily found and quickly removed.

It is true that the fœtor of syphilitic nasal disease is distinguished generally from all other varieties of fœtor by its almost insufferable intensity, but that is simply because in syphilis, as is well known, the rapid and wide-spread necrosis furnishes such large masses of dead decomposing material that the fœtor is only equalled by that of gangrene. For my own part, I can distinguish no difference in quality between the two stinks.

The question of the cause of the fœtor cannot be considered sufficiently answered, without explaining why in one series of cases there is crusted secretion which does not smell.

It is certainly not easy to find an answer to this question which shall apply to every case, all the more as cases of this sort,

* This neglect of the use of the probe is by no means general. Schuster (142) in particular strongly recommends its use.

which are distinguished as **atrophic rhinitis without fœtor**, are decidedly rare. The explanation which occurs to one first, is that the cases in question are mostly those in which in the course of time a cure has been effected by Nature, just as, in the cases described above, we have seen it effected by art. This applies to cases in which fœtor was at one time present, and one must assume either that necrotic bones or soft parts have been separated and thrown off, or—a more frequent case—that in process of growth, or from inflammatory atrophy of previously swollen parts, the natural openings of the sinuses have become wider, and the conditions more favourable for drainage. Cases of syphilis which has run its course unrecognised may also be included here. At all events, it is so frequent to find odourless crust formation in cases of nasal syphilis years after any necrosis, that it is natural to assume this as a cause in many cases in which the syphilitic origin is not very obvious.

In this last assumption I am strengthened by the observation that large losses of substance in the turbinals sometimes heal in such a way that they afterwards appear as if they were cases of simple atrophy, without any essential change of form except the diminution in size. I have observed this particularly well in cases where I myself have removed turbinals—partially or entirely. I recall especially one case of tuberculosis of the nasal mucous membrane, in which the left lower turbinal was so involved that I was obliged to remove it, bone and all, with forceps, almost to the posterior end. When healing was complete, I could not have told, if I had not known beforehand, that such an operation had been performed, for the remains of mucous membrane had grown in such a way that an atrophic lower turbinal seemed to be present. Similar cases not quite so marked I have seen frequently. (Walb⁽¹⁴³⁾ also 'could find no defect in the bony framework of the nose, or that any bone had been removed' in a patient from whom a piece of bone had been broken out by another surgeon.) Besides this, certain growths which especially affect the middle turbinal indicate that syphilis is the cause of the atrophy.

Post-Syphilitic Growths.

After nasal syphilis has run its course, it is not rare to see certain pale friable swellings in the nose. They may be slightly granular or smooth, lobulated or bunched, and they can generally be removed by the snare. They consist partly of outgrowths from various component elements of the mucous membrane, especially the mucous glands, but chiefly of a dense small-celled tissue having the appearance of medullary sarcoma.

I have found such swellings in several cases of apparently primary atrophy of the turbinals, cases which were not considered syphilitic simply because there was no visible loss of substance. For, as a matter of fact, loss of substance constitutes a distinctive feature of many cases of old, time-expired syphilis, so that in examining one must ask one's self whether, in the absence of holes in the septum or palate, or other characteristic residua, it may not be possible to recognise, simply from the width of the nose, that it is the result of (syphilitic) ulceration of the turbinals.

The reason why the crusts are no longer fœtid in syphilis which has run its course, seems to be, in the first place, that the secretion is no longer so copious, and, in the second place, that the destruction of parts has left the nose so wide and roomy that the secretion dries sooner, before decomposition has time to occur. For decomposition can only occur in the presence of liquid. Dry matter does not decompose.

That is, in fact, the only connection between fœtor and crust formation; of that mystical view according to which the 'characteristic' fœtor can only develop in the crusts, there is no proof, except the circumstance that rapid and complete crusting of the secretion is calculated to prevent the development of fœtor. This leads us to the answer to the third question.

3. Why has the Fœtid Secretion the Form of Crusts ?

As it is generally admitted (except by E. Fränkel) that the crusts are nothing more than dried pus, the explanation of the crusting must be a physical one. Either the secretion contains less water, or the conditions to which it is exposed are more favourable for drying, or there is a conjunction of both circumstances. It has not yet been proved experimentally that the secretion contains less water, but I have a decided impression, from observation of cases, that it is so.

Just those cases in which there is the strongest tendency to crust formation, furnish a lumpy secretion containing much mucus, whilst those in which this tendency is less pronounced have a more liquid and unformed secretion. But whatever the composition of the secretion, it must be retained in the nasal cavity for a certain length of time, till it is sufficiently dried, otherwise no crusts can be formed. The conditions are specially favourable to this drying process in wide nasal cavities, because in them the volume of air is greater, and the secretion, being spread over a larger surface, forms a thinner layer; but this is evidently not the whole explanation, for crusts also form in narrow nasal cavities.

A more important factor is the inability of the expiratory air-stream to remove the secretion, either because its density and speed are insufficient to enable it to act as a competent *vis a tergo*, or because it sweeps over the surface of the secretion without, as it were, getting hold of it from behind (*e.g.*, in the roomy recesses of abnormally wide noses), or because it fails to enter certain recesses, as when the nasal cavity is naturally narrow, or when the recesses are narrowed by swelling of the mucosa or by new formation. Finally, it may be none of these things, but just that the secretion is too sticky to be loosened from the mucous membrane.

To sum up the results of the foregoing considerations, we may say that nothing remains of the mystical hypothesis without which it was considered impossible, till recently, to explain the phenomena of 'ozæna.' On the other hand, we have attained the following results:

1. There is no constant anatomical and pathological condition peculiar to cases of crust formation in wide nasal cavities.

2. There is no hereditary or anatomical predisposition to which the peculiar morbid process described as 'fœtid atrophic rhinitis' necessarily corresponds.

3. The existence of a peculiar general inflammation of the nasal mucosa, manifesting itself in atrophy and the formation of fœtid crusts, is unproved.

4. The existence of a 'genuine' or 'essential atrophy' is unproved.

5. The view that all cases of fœtid crust formation depend upon empyema of the accessory sinuses is disproved.

In short, none of the theories hitherto advanced are proved, nor even the existence of a disease 'ozæna.'

On the other hand, it is proved—

1. That in a series of cases of 'ozæna' carefully investigated, the secretion was found to come from focal suppurations of various kinds.

2. That crust formation and fœtor occur under various conditions.

3. That they often occur together, but often also separately, both with and without atrophy of the mucosa.

From all this, it follows that we are only justified in using the name 'ozæna' as designating a symptom, and that the term 'fœtid atrophic rhinitis' should be dropped—at least, till better proof is adduced of the existence of the process so designated.

To proceed with our consideration of the secretion.

In many cases of chronic nasal suppuration, a certain periodicity strikes one in the discharge, and that in a double sense. Patients often say that the secretion is most copious in the morning on waking, and for a few hours thereafter, or even that it is limited to that time. This sign—morning discharge—has been by some considered as distinctive of empyema of the maxillary antrum, and this in view of the conformation of the cavity. It is pointed out that the ostium maxillare is at the highest part of the cavity when one is lying on the back, and at its lowest part when one is lying prone, in which position liquid contents most easily escape. And certainly an antrum which has filled up during the night, while

the patient was lying on his back, empties itself more easily as soon as he gets up.

But, on the other hand, this sign is also met with in diseases of other cavities, and if these (except the sphenoidal sinus) can empty themselves into the nose while a patient is in the dorsal position, this is also possible in the case of the antrum, as I have several times seen. Now, secretion so escaping during the night is not discharged externally, but accumulates in the nasal passages—in the common ducts as I have called them—till by the patient moving or getting up it is brought within reach of the respiratory air-stream; but it is not till the patient is awake that it excites sufficient irritation to lead to its expulsion by blowing the nose.

Thus, the discharge of a purulent mass from the nose in the morning only, is neither a characteristic nor a constant symptom of empyema of the antrum. For in some cases the discharge goes on during the whole day, at intervals, and in comparatively equal quantities.

The other kind of periodicity one observes in empyema consists in periodic remissions and exacerbations. The purulent discharge may almost cease—may quite cease to be noticed—for months, and then suddenly become as copious as ever. As a rule, however, the periods are not so long continued, and do not exceed a few weeks or days. Their relation to season and weather is different for different persons, but constant in the individual case. That is to say, one case will be worse in dry summer weather, perhaps on account of the dust, etc., whilst another case will relapse when it is cold and wet. The latter is the more frequent condition.

As a rule, however, with the diminution of discharge (except when it extends over a long time) there is an increase of the other troubles, so that it is to be looked upon less as a diminution, than as a retention of discharge, caused, for instance, by catarrhal or other swelling obstructing the opening of the affected cavity. Such swelling certainly does not occur in every catarrh; on the contrary, many patients feel better then, but whether this is due to increased thinning of tough secretions, or to other circumstances, can only be decided by examination of the individual case.

Another peculiarity of nasal suppuration is the fact that it is (generally) unilateral. The presence of this sign, speaks more for the presence of unilateral disease, than its absence speaks against it. For although the pus in any given case is formed only on the affected side of the nose, yet it may easily flow into the naso-pharynx, and so come to be expelled from both nostrils.

Although patients often deny the presence of a unilateral discharge, not having noticed that the pus only comes from one nostril, yet the condition just referred to, in which there is bilateral discharge and unilateral disease, is by no means rare. Both nostrils may be seen full of pus, and it is often a matter of considerable difficulty to find out where it comes from. It would be absurd to conclude in such a case, that, simply because there was pus in both nostrils, therefore there was disease on both sides. The methods by which errors are to be avoided, and the pus traced to its true source, belong to special diagnosis. If the pus always appears on the same side, one is justified in supposing that the disease is also on that side, but there are no mathematical laws in pathology, and Burger ⁽¹⁴⁴⁾ observed a case in which there was an accumulation of crusts on one side of the nose, originating from an empyema of the antrum on the other side of the nose. I have myself seen one similar case, in which the pus crossed over by the naso-pharynx, and two others, in which a perforation of the septum allowed the secretion to cross over.

Finally, there is the paradoxical occurrence of nasal suppuration without any discharge of pus from the nose. In a number of cases in which the existence of nasal empyema can be established by the presence of other symptoms which it causes, patients state most definitely that there is no excessive secretion from the nose, but, on the contrary, that it is unusually dry. Further inquiry elicits the fact that they suffer from 'phlegm in the throat,' or some other ambiguous description such as patients frequently apply to their symptoms. All the secretion, in fact, flows into the naso-pharynx, and thence into deeper parts, from which it is expelled, especially in the morning, in the form of tough crusts or rounded masses, which are only got rid of after much coughing, retching,

and clearing the throat. Sometimes even hæmorrhage is caused.

The point at which the pus appears is often of value in diagnosis, by giving one's suspicions a definite direction, but it rarely suffices for diagnosis, for pus in the nose is often found far from its point of origin, and favoured by the grooves and recesses of the cavity, it often appears at a distant part without leaving any visible trace of its passage. Thus, I have seen pus from the frontal sinus far back, and from the sphenoidal sinus far forward, pus from the antrum behind on the septum, and pus from the anterior ethmoidal cells at the hiatus semilunaris. According to the slope of the lower spongy bone, pus from the antrum flows forward into the nose, or backward into the naso-pharynx; according as the ostium maxillare is narrow and situated high up, or wide and gaping and placed low down (just above the lower spongy bone), we find the pus from the antrum apparently coming from the sphenoidal sinus, or filling the lower meatus. In a narrow nose with the middle turbinated body close to the septum, pus which finds its way on to the middle turbinated body may be sucked up by capillary attraction as high as the lamina cribrosa, or it may be driven up to the roof of the nose, by the pump-like action which the respiratory air-stream exerts in a narrow nasal cavity. I have seen examples of both.

Again, the masses of secretion which are sometimes found on the floor of the nose, may have their origin there, or in the most distant parts of the cavity. One must always remember, that almost every cavity in the nose is equally competent to act (*a*) actively, as a suppurating centre, and (*b*) passively, as a reservoir in which pus is simply retained.

If one suspect that the pus does not come from the place where it appears, one may plug the channel between the place where it appears, and the place from which it is suspected to come; and then by examining after some hours, or even after a day, one finds the pus at its place of origin, dammed back from spreading along its usual route. This method is a sure one, but demands very great precision, and exact observation; it is, however, useless in distinguishing between nasal and naso-pharyngeal suppuration.

In order to make out whether pus, which may be found in the naso-pharynx or the nose (or in both), originates from one or other of these cavities, further tests must be applied. If the naso-pharynx be found more or less filled with secretion, but showing healthy walls when the secretion is cleared away, then the source of the suppuration must of course be sought for in the nose. But even well-marked pathological changes in the naso-pharynx by no means exclude a nasal origin of the suppuration. Especially one must not be misled by the presence of adenoids, as empyema may very well be present at the same time (*vide antea*).

Suppose the bulk of the discharge is in the naso-pharynx, but some is also visible in front, say in the middle meatus, at a spot where the expiratory stream cannot get behind it, one may be quite sure in such a case that the seat of disease need not be sought for posteriorly, for pus which is formed at the back of the nose, can only be *blown* forwards and upwards by the action of the expiratory air-stream; it cannot possibly *flow* in that direction. That is only one example of many eventualities, showing how, in the examination of a case, one may be guided in particular directions. In case of difficulty, the nose should be cleared of secretion, and the most exact inspection made, combined with the use of the probe. Only in this way will it be possible to make out the seat of disease, and it is a good plan not to rest content with the discovery of pathological conditions, however considerable, till one has proved that every part of the nose where pus can still be seen is normal, more especially the anterior parts of the cavity.

This applies particularly to the middle meatus; pus in the lower meatus does not so readily excite suspicion of disease there, seeing that it serves as a sort of common duct for the nasal cavity.

Where two lesions are present, it happens sometimes that one cannot make up one's mind as to which of them is the cause of the suppuration. To decide the point, one of the morbid conditions present is taken in hand and treated. If the suppuration is cured, well and good; if not, one knows that something else is at the bottom of the mischief, and can turn one's attention to the next most obvious condition.

I must not omit to mention the difference between pus from the nose and pus from the lung, for the two are often enough confounded. Careful examination of the way in which the pus is expelled, will generally quickly decide the question. The very stupidest of patients knows whether he has coughed up pus, or whether he was obliged, by vigorous aspiration, to draw it out of the nose into the throat.

Often one requires to give the patient a practical demonstration of the latter process. In case of doubt the lungs ought, of course, to be carefully examined.

Finally, I have repeatedly noticed a circumstance which seems to me of great importance, and well worthy of the attention which it has hitherto escaped, viz., the fact that there are often two kinds of secretion present at the same time, in cases of nasal suppuration. Thus, one may see, at the same time, formed masses of amber-coloured mucus, and formless yellow secretion, liquid, or tough and stringy. The latter may only be present in small quantity, but it can be seen on inspection; while the former may only be discharged when the probe has been passed into the nasal passages and accessory sinuses.

The fact that the masses or lumps of amber-coloured secretion come from a region which is out of sight, suggests that they spring from the real seat of disease; and the formless and more purulent secretion only from adjacent parts of the nose.

Again, it sometimes happens that after one has most carefully cleared the nasal cavity of pus, more or less copious, and perhaps even washed out some of the accessory sinuses, till they are apparently quite empty, some part of the field of vision is covered with a colourless, stringy, formless mucus, perhaps in large quantity, which must certainly come from some cavity, for only certain parts of the field—generally the upper and most anterior parts—become re-covered with this secretion after it has been wiped off. This sequence of events is due to the fact that in many cavities the secretion is almost pure mucus, whilst the production of pus requires a considerably longer time. Thus, the pus which is first evacuated, belongs to an earlier secretory period, so to speak, whilst the

mucus which is being continually renewed before one's eyes, is the result of secretion during the actual period of observation, and has not had time to become purulent. A knowledge of this circumstance is extremely important in diagnosis, for it is obvious from what has been said, that a mucus secretion may be just as significant as a purulent one, and that we may be obliged to refer both to the same cavity; and this must plainly influence our conclusions as to the position and extent of suppurative disease.

A comparatively rare occurrence in nasal suppuration is

II. Epistaxis.

Occasionally there is only a brownish-red or black discoloration of the discharge; more frequently, on blowing the nose, the secretion is streaked with blood in small quantity, which is generally found to come from the typical bleeding-spot at the anterior part of the septum. The hæmorrhages generally arise from the detachment of crusts, which are particularly liable to adhere to this, as a dry spot. The crusts are generally detached by the finger-nail, or by the act of blowing the nose.

Occasionally the bleeding-spot is situated higher up on the septum, in front of the middle turbinal, or on the turbinal itself, and the bleeding then proceeds, as a rule, from erosions of the mucosa, such as frequently occur in empyema, at parts much irritated by the discharge.

More characteristic, however, than such spontaneous and comparatively rare hæmorrhages, are those which follow even the lightest touch with the probe. In cases of bone disease, for example, however gently one may probe the middle meatus, hæmorrhage nearly always occurs, and often in considerable quantity.

The kinds of hæmorrhage just described stand by themselves, and are comparatively unimportant. Much more interesting is the record of a case of excessive hæmorrhage occurring in connection with empyema of the sphenoidal sinus and ethmoidal cells.

The patient was a man of 36, who had been for a consider-

able time under treatment. The left side of the nose was affected, and the maxillary antrum was diseased, in addition to the sphenoidal and ethmoidal cells. One day, without anything having been done to him, he began to bleed from the left nostril as he was going along the road. The blood did not come slowly by drops, but rapidly in a continuous stream. Two hours afterwards he came to me, bleeding steadily, and so freely, that in spite of holding a handkerchief to his nose, he left a bloody trail along the passage from the front-door to my consulting-room. As far as one could see for the hæmorrhage, the blood was coming from high up between the middle turbinal and the septum, but the flow was so free that, in spite of firm plugging, it ran in a splashing stream from the right nostril and the mouth. I took a Bellocq's cannula, thinking to plug both anterior and posterior nares, when the patient collapsed and fainted. The bleeding stopped at once, and did not return, although, as he was almost pulseless, I held him up by the feet, and afterwards gave him hot spirits and water. The anterior plugs sufficed.

Next day, when the plug was removed, a clot could be distinctly seen, behind and high up, in the region of the posterior ethmoidal cells and the sphenoidal sinus. The nasal cavity was very narrow. As already mentioned, empyema was present with extensive caries, and there is no doubt that a branch of the posterior nasal artery had been eroded by the spreading ulceration. Although the case was afterwards submitted to vigorous operative treatment, including amongst other things almost complete removal of the middle turbinal, there was never any more spontaneous bleeding, and the hæmorrhage caused by the various operative procedures was very slight.

In a second case of almost uncontrollable epistaxis, to which I was called, I was able to make out that the bleeding proceeded from the upper and back part of the nose, probably from the posterior nasal artery, and also that there was suppuration in the same region. I do not know what became of this case. Such severe cases of nasal hæmorrhage are recorded here and there in the literature of the subject, but in practice they are no doubt encountered more frequently. Noteworthy is Scholtz's

case (⁹⁶) in which fatal hæmorrhage took place from the eroded cavernous sinus. Such cases ought to make one examine very carefully for disease of the deeper parts.

Next in frequency to the abnormal secretions described above as symptomatic of chronic empyema, comes nasal obstruction, caused, for example, by

III. Polypi and Hypertrophies.

Recent publications make more frequent mention of the occurrence of these growths in empyema, but many writers seem to have accepted the view that polypi and hypertrophies are to be considered as causing empyema by bringing about retention of secretion, especially in the case of the antrum. Thus, they consider the growths the primary condition. Bayer's (¹⁴⁵) view is more adaptable; he thinks that sometimes the empyema is primary, and sometimes the polypi. In the most recent literature, we find at least in Killian's (³⁹) remarks, a recognition of the fact that polypi are a consequence, rather than a cause of empyema.

My own view is that **polypi in a majority of all cases are almost as good as pathognomonic of empyemata of the accessory cavities, or focal suppuration in the nasal passages.** (How far this view coincides with Woakes' (¹⁴⁶) will be discussed farther on.)

To avoid confusion, let us understand by polypi only smooth gelatinous growths, not papillary tumours. A histological nomenclature is hardly practicable, as many of these tumours are composed of small-celled mesh-forming tissue, and others contain chiefly specific elements of the mucous membrane, glands, etc. I have for long been interested in the question of the recurrence of these growths, and also as to whether they represent anything *sui generis*, or are related more closely to the ordinary, more homologous hypertrophies of the nasal mucous membrane.

Now, since the time when I began to interest myself in the symptomatology of polypi, I have found suppuration almost always present along with them. It would, no doubt, be simpler to content one's self with establishing the fact of this connection

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(as is done in a very well-known text-book); but, as a matter of fact, it is just the neglect of this relation, from a practical point of view, which in the majority of cases, leads to the continual recurrence of the tumours.

It is remarkable, at any rate, that I, as soon as I became aware of the connection, on re-examining several cases, was able to find suppuration where I had not previously noticed it. That suppuration frequently escapes notice I am certain, from the fact that I often have patients sent to me with considerable empyemata, which have not been diagnosed or treated; but the polypi have often been repeatedly removed.

The ætiological relations of these tumours to focal suppuration in the nose, can only be cleared up by an impartial investigation of every case, in this particular direction. No one would ever have ventured to advance the above thesis, if nothing more had been made out than the frequent occurrence of the tumours in cases of empyema. For a length of time now, I have kept careful record of all my polypus cases, and have endeavoured by a careful weighing of facts to clear up this relationship. Unfortunately, no other author seems to have felt himself called upon to sift all his polypus cases in this way. The numerous reports of cases of empyema in which polypi are mentioned as being present are therefore useless for the solution of this question, and in the same way the remark, frequently heard of late, that one has seen many cases of polypus without empyema, proves nothing more than I have already said, viz., that polypus formation occurs from other causes.

(For the rest, it might have been guessed that even I only found empyemata where there was pus.)

Of all recent literature, only Harke's cases are available in this connection: everything is impartially recorded. The results confirm my own experience.

Case 24.—Mucous polypus of the lateral edge of the right hiatus semilunaris—pus in both antra.

Case 83.—Polypus formation to a moderate extent on the hiatus semilunaris of both sides—pus in the right antrum, brownish serous fluid in the left antrum and both sphenoidal sinuses.

Case 99.—A fine-stalked mucous polypus at the left accessory opening—muco-pus and polypi in the left antrum, etc.

Case 214.—A mucous polypus springing from the left bulla—suppuration of the frontal and sphenoidal sinuses, and the antra.

Case 287.—Mucous polypi springing from the right unciform process and the neighbourhood of the hiatus—pus in the anterior ethmoidal cells and the right antrum; on the left side probably in the antrum and sphenoidal sinus.

Case 307.—Small polypoid growths on the right bulla—pus in the right sphenoidal sinus and anterior ethmoidal cells. Gelatinous swelling of the mucous membrane of the right antrum, but no secretion.

In addition to the above, there are three cases, which, according to the description, cannot certainly be pronounced polypi, but which yet require consideration :

Case 121.—Pronounced polypoid swelling on the left unciform process. Accessory cavities negative.

Case 145.—Polypoid hypertrophy of anterior end of left middle turbinal. Small hæmorrhages in the sphenoidal sinus, but nothing more.

Case 367.—Polypoid hypertrophies of the mucous membrane on the anterior end of the left middle turbinal, and on the right hiatus. On the floor of the left antrum the mucous membrane somewhat thickened, and containing little cysts with gelatinous and muco-purulent contents. In the right antrum, enormous gelatinous swelling of the mucous membrane, but no free secretion. Masses of foetid green pus in the nose and nasopharynx.

The above series embraces all Harke's cases of tumour formation having any connection with polypi, and offers, I think, food for reflection.

In order to pursue this subject, I give below a résumé of all my recent polypus cases, impartially reported. A critical perusal of these notes will perhaps make it clear why most noses in which polypi grow also show empyema, and also why polypi are said to be 'much more frequently' observed without empyema.

1. W. R., female. Several polypi removed by Professor X. Has never been probed. Polypi are present in both middle meatūs, proceeding from the middle and anterior ethmoidal cells. No discharge.

2. B. S., male, 67. Left nostril full of masses of pus, both

liquid and dried. Middle turbinal pale, friable, uneven. Extensive caries in the outer part of the middle meatus. Middle turbinal removed. Next day several small polypi, hitherto invisible, bulged out. Pus in middle ethmoidal cells.

3. G. S., male, 40. Polypi several times removed by Professor B. in B. and Professor X. in Y. Never been examined with the probe. Both nostrils full of small and medium-sized polypi. The probe demonstrates extensive caries of the ethmoid, on both sides of the middle turbinals.

4. C. S., male, 32. Nasal suppuration for the last three years. Copious purulent crusts on left side. After applying tampons for three days, it became possible to use the probe, and a rough-walled cavity was found in front of the left middle turbinal, above and external to it. A very small polypus on the lower lip of the hiatus.

5. E. P., female, 44. For years past intermittent discharge from the nose, sometimes gray, sometimes yellow. Two little polypi the size of peas on the anterior end of the right middle turbinal, which is somewhat thickened. Rough bare bone in the middle meatus on both sides.

6. A. E., male, 4½. Nasal suppuration for the last year, following pneumonia. Both nostrils full of muco-pus. Adenoids. After their removal breathing free, but discharge increased. On anterior end of left middle turbinal, a dependent polypus. The probe passes laterally into a wide, rough-walled cavity, from which pus wells out. Empyema of the left anterior ethmoidal cells.

7. J. K., male, 48. Profuse nasal suppuration for last three years, following influenza. Several polypi in left middle meatus. Granular thickening of lower and middle turbinals. In both middle turbinals are rough-walled cavities, containing pus, which the probe enters from the outside. Empyema of middle ethmoidal cells. Three months later. Smooth lobulated enlargement of the anterior end of the right middle turbinal. Empyema of antrum on both sides.

8. K. H., male, 41. Secretion never increased. Right nostril almost blocked by swelling of lower turbinal, and crista septi. Left nostril freely pervious. On the anterior end of the middle turbinal is a soft gray hemispherical swelling, freely movable—a polypus. The mucous membrane everywhere feels normal to the probe.

9. A. F., male, 20. Since childhood profuse foetid suppuration from the left nostril and the throat. Slender lobulated polypi hanging down from the anterior end of the middle turbinal. Laterally, copious liquid creamy pus wells out. The probe shows extensive caries of the ethmoidal cells. Antrum?

10. Described on p. 27, under Case 1.

11. Described on p. 28, under Case 6. Rough bone in the right middle meatus, with discharge of muco-pus.

12. Described on p. 28, under Case 2. In addition there are a number of polypi in the left nostril, and in the right middle meatus. Empyema of the left ethmoidal labyrinth, the sphenoidal and frontal sinuses, and, on the right side, of the middle and posterior ethmoidal cells, and the sphenoidal sinus.

13. H., female, 48. On the right side polypi, removed by Professor X. in Z. Empyema of right antrum, operated on by Professor Y. in Z.

14. C. S., male, 50. Three years ago there was copious yellow discharge from the throat, nasal obstruction, and headache. Two years ago polypi were found on both sides by Professor X. in F., and removed by Professor Y. in Z. The probe was never used. At the operation, bone was removed on the left side, on account of narrowness of access, as the patient was told. Since then there has been no suppuration. On examination, the greater part of the left middle turbinal was found to be gone, exposing the antrum and some of the ethmoidal cells.* The patient assured me that he had never been asked about discharge, nor had it been observed, as it all found its way into the throat. The only proper treatment had been unintentionally carried out, the operator being quite guiltless of the successful cure. A case typical of many reported as 'polypi without empyema.'

15. T. V., female, 46. For the last six years, suppuration in the left side of the nose, very severe head troubles, melancholia, loss of voice (the patient had been a prominent singer). During the last eighteen months polypi had been repeatedly removed by Professor X. in Z. The nose had never been examined with the probe. The view of the left nostril was obscured by quantities of fœtid pus continually welling up. The probe detected rough softened bone all over the middle turbinal. Almost all the teeth were wanting from the left upper jaw, the second molar loose. When extracted by a dentist, a considerable quantity of pus welled out through the socket. Empyema of the left antrum.

16. J. S., male, 58. Complete nasal obstruction for the last fifteen years. No discharge or hæmorrhage. The nasal bones and soft parts of the nose pressed asunder. The nose and upper part of the throat stuffed with polypi, from the size of a pea to that of a pigeon's egg, springing from the middle turbinals and roof of the nose, about eighty altogether. In addition, lobulated hypertrophies of the lower turbinals. During the extirpation of the polypi copious masses of tough muco-pus were repeatedly discharged, originating in large cysts

* Depicted in my 'Atlas of Diseases of the Mouth,' etc., Fig. 63.

in the polypi. The whole of the ethmoidal labyrinth absorbed from pressure. No disease of accessory cavities.

17. K. F., female, 36. Polypi several times removed in A. and B. No examination with the probe. Polypi growing from the front of both middle turbinals. Empyema of anterior ethmoidal cells on both sides.

18. A., male, 48. For many years increased secretion of phlegm in the throat. Upper part of left nostril blocked by a firm, smooth, reddish, flap-like growth of the middle turbinal. After removal of this, grayish mucus showed itself at the lower edge of the middle turbinal, and the probe could be passed through a cleft, now visible in the middle turbinal, into a cavity lined by smooth mucous membrane; catarrh of a dilated middle (ethmoidal) cell.

19. O. H., female, 25. Nasal suppuration of fourteen to seventeen years' standing. Two years ago several polypi removed by Dr. X. in B., but the probe was never used. Dr. Y. in B. operated on an empyema of the left antrum; Professor Z. in B. found and treated empyema of the middle ethmoidal cells; and, finally, I myself operated on an empyema of the left frontal sinus.

20. Reported on p. 28, under Case 3.

21. K. W., male, 36. Has had discharge of pus for many years, but only from the throat. In the left middle meatus a firm polypus as big as a hazel-nut. After removal of this, the probe passed into a small cavity lined by mucous membrane, one of the anterior ethmoidal cells. Afterwards, several polypi appeared in the middle meatus, and laterally from them was smooth bare bone. The antrum was freely opened, and found suppurating, and lined by smooth mucous membrane.

22. E. v. H., female, 46. For the last twelve years suffered from dyspnœa, palpitation, asthma. Was treated by sixteen doctors without benefit, till Professor X. in Z. removed some nasal polypi, which freed her from her 'diseased heart.' For the last five years has had frequent recurrences of polypi, which have been removed. Last recurrence three months ago. Has never been examined with the probe. Much yellow mucus passes into the throat. In both middle meatus there is much muco-pus; on the right side there is a broad adhesion between the middle turbinal and the septum. Examination with the probe shows that the secretion comes, on the right side, from the middle ethmoidal cells and the sphenoidal sinus, without disease of bone; on the left side from the middle meatus. Besides this, there is partial bony occlusion of the choana on the right side.

23. H. G., male, 47. For the last year and a half has had nasal obstruction, with secretion of yellow mucus. Both nostrils

filled with polypi between the septum and middle turbinal, the growths varying from the size of a bean to that of a hazel-nut. The probe gave no positive result. Treatment was broken off before the origin of the secretion could be made out.

24. M. L., male, 45. Has had a foetid discharge for two or three years, chiefly from the throat. Lobulated polypi of the left middle turbinal. Empyema of both antra, and of the right sphenoidal sinus (which was plainly exposed), as well as of both frontal sinuses.

25. H. P., male, 37. Foetid nasal suppuration for three or four years. Both maxillary antra drilled for empyema by Professor X. in A. Polypi removed from both nostrils by Dr. Y. in A., and the opening of the frontal sinuses suggested. Both nostrils were full of foetid pus. The middle turbinals were thickly covered with little polypoid growths, between which the probe everywhere passed into rough-walled cavities in the soft friable bone. Empyema of both ethmoidal labyrinths.

26. E. S., male, 45. Right nostril blocked by several polypi. They are gray, rounded, about as big as a hazel-nut, and spring from the middle meatus. No abnormal secretion. Result of probing negative.

27. J. F., male, 46. For many years has had increased secretion from the nose — often purulent. Dr. X. in Y. removed a small polypus from the right middle meatus, and found rough bone on the ethmoid at the same time. On both sides there was an apparent duplicature of the middle turbinal. Pus welled out of both clefts, and on the left side, also mesially from the middle turbinal. Both antra were punctured, and a copious discharge of pus blown into the nose; they were then freely opened. Discharge continuing, Dr. X. opened the left middle ethmoidal cells, which also contained pus. It is not yet decided whether the suppuration was exclusively ethmoidal, or also antral.

28. J. D., male, 55. Profuse foetid suppuration for the last four years, since having influenza. A quantity of pus on the left middle turbinal, which is cleft, and studded with polypi. The probe passed through the cleft into a wide, rough-walled, bony cavity as big as a walnut. Puncture from the lower meatus and washing out the antrum brought away frightfully foetid cheesy pus.

29. Reported on p. 28, under Case 4.

30. Reported on p. 28, under Case 5. Empyema of both antra and all the ethmoidal cells.

31. Asthma. Much mucus in the throat. In the right middle meatus much muco-pus behind a lobulated polypoid enlargement of the anterior end of the middle turbinal; also

several smaller polypoid excrescences upon the upper surface. The probe discovers no bare bone in the middle meatus.

32. K. F., male, 25. Purulent secretion from the nose and throat since childhood. In the summer of 1890 I removed a posterior hypertrophy of the lower turbinal. No inquiry was made about suppuration at that time; it was overlooked entirely. Later, empyema of both antra was found.

33. J. K., male, 51. Suppuration of the right nostril for the last four or five years; later, nasal obstruction. In 1890 I removed several polypi, and overlooked the suppuration. In 1894 frightfully fœtid pus was evacuated from the right antrum.

34. F. B., male, 33. Polypoid hypertrophies of the mucous membrane of the middle and lower turbinals. No abnormal secretion.

35. J. D., male, 45. Frightful headache for the last six months, and profuse suppuration on the right side. A pale red polypus as big as a hazel-nut on the anterior end of the right middle turbinal. Upwards and outwards the probe passed into a wide cavity, which represented the ethmoidal labyrinth with the cell partitions destroyed. The antrum contained pus and also polypi.

36. A. B., male, 45. For several years had suffered from recurring polypi, which had been removed by Professor X. in Z. In both nostrils there are numerous polypi, some as large as a hazel-nut, growing from the middle turbinals and roof of the nose. In the meatūs the mucous membrane has undergone polypoid degeneration, and the ethmoidal cells and the lips of the sphenoidal sinus are studded with polypi. There has never been suppuration, and none can be detected now, nor is there any sign of focal disease.

37. J. K., male, 28. Swelling of both lower turbinals. On the inner surface of the left middle turbinal a polypus as big as a lentil-seed. No abnormal secretion.

38. H. O., male, 22. For at least twelve years had suffered from fœtid crust formation, especially in the throat. A lobulated polypus as big as a hazel-nut, at the anterior edge of the right middle turbinal. Laterally from both middle turbinals the probe passed into wide, rough-walled, bony cavities, which discharged pus. Ethmoidal empyema.

39. G. F., male, 36. Some nasal obstruction for at least five years. Yellow mucus on blowing the nose, etc. Hypertrophies removed from left nostril by Professor X. in A. Lobulated polypoid thickening of the anterior end of the right middle turbinal. Small polypoid growths in the middle meatus, and slight growths on the left middle turbinal. Pus in the lower anterior ethmoidal cells and the sphenoidal sinus of the right

side, without bone disease, and also in the right antrum and left frontal sinus.

40. F. M., male, 22. Nasal obstruction of twelve years' duration, and much discharge from the throat of greenish-yellow masses and crusts, frequently foetid. A piece of tissue (apparently hypertrophied) removed by Dr. A. in B. Had never been examined with the probe. It passed laterally from the right middle turbinal into a suppurating cavity, bounded by soft friable bone and soft parts. When freely opened, little polypi became visible at the outer edge of the middle turbinal, and anteriorly towards the roof of the nose.

41. M. H., female, 77. Old nasal obstruction. Both nostrils stuffed with polypi, and glassy-looking papillary growths of the lower turbinals. On the left side there was muco-pus, and a history of similar discharge in the past. Probing negative. The advanced age of the patient led to treatment being abandoned as soon as the nasal obstruction was to some extent removed, and the source of the secretion remained undetermined.

42. A. M., female, 13. For several years had suffered much from catarrh, cough, headache, etc. Adenoids: copious secretion of muco-pus on the floor of the nose, both sides. Marked posterior hypertrophy of both inferior turbinals; lobulated hypertrophy of anterior ends of middle turbinals. The mucopurulent discharge continued after removal of the adenoids, and several gray mucous polypi appeared in the left middle meatus. Finally, the masses of muco-pus were found to come from the maxillary antra, which were accordingly opened.

43. M. L., female, 43. Tuberculosis of the nose. The right antrum and some of the ethmoidal cells on the left side were opened, partly by the disease spreading, and partly by operative treatment, and they began to form pus (not specific, however). Two years later, the parts that had been operated on showed no tendency to recurrence, but the mucous membrane of the left middle turbinal began to degenerate into glassy-looking, flap-shaped polypi.

44. J. S., female, 25. Nasal suppuration for the last six or seven years, nasal obstruction for the last four. A large retro-nasal polypus on the left side; multiple polypi on both sides. The whole of the ethmoid labyrinth, both antra and frontal sinuses were made out by degrees to be full of pus.

45. K. M., female, 20. A polypus the size of a hazel-nut in the naso-pharynx, growing from the left choana. Left nostril completely blocked with polypi, and contained much muco-pus. The probe penetrated on both sides from the middle turbinal into bony cavities. The patient withdrew from observation as soon as the nasal obstruction was removed.

46. J. H., male, 21. Purulent discharge for the last five or six years. Nasal obstruction for the last six months. On both sides multiple polypi on the middle turbinals and towards the superior meatus. The spongy bones show loss of substance in many parts; the probe demonstrates the presence of pus in numerous bony cavities situated upwards and outwards from the middle turbinals. Bilateral ethmoidal empyema.

47. A. F., male, 17. A polypus the size of a bean on the lower edge of the left middle turbinal. Secretion of mucus from the middle meatus. Hyperæmia of the lower turbinals. Probing negative.

48. M. M., female, 31. Nasal suppuration of four or five years' duration; right nasal obstruction for one year. Polypi removed by Professor X. in A. Antral empyemata discovered and operated on by Dr. Y. in B. Had never been examined with the probe. Profuse suppuration continued, although when the antrum was washed out almost nothing came from it. There was pus between the septum and the middle turbinal, which lay close against it. In front of the middle turbinal the probe penetrated outwards into several suppurating cavities with brittle bony walls; ethmoidal empyema. In addition, after these cavities had been laid open, a copious flow of liquid pus took place into the middle meatus, coming from above, and the probe passed into a wide cavity; frontal empyema.

49. E. W., female, 25. Copious secretion of yellow mucus for the last five months; nasal obstruction for two and a half months. On both sides a small polypus in the middle meatus; hypertrophy of both lower turbinals. Probing negative. After removal of the polypi the secretion became purely mucous. Exploratory puncture of both antra showed that they were both full of glassy mucus. Catarrh of the antrum.

50. M. F., female, 44. Purulent discharge from the left nostril of two to three years' duration—at times foetid. Apparent duplication of middle turbinal. A small polypus on the 'lateral swelling.' Puncture of the left antrum disclosed intensely foetid pus.

51. B. S., female, 45. Free discharge of pus from the throat for six months; for three months right nasal obstruction and swelling of the nose externally. Two very large flap-like polypi of the middle turbinal; a part of the bone which was removed with them was bare in parts, reddened and rough. Pus welled freely out of several of the ethmoidal cells, and in addition there was free communication with the frontal sinus, which suppurated profusely.

52. A. L., male, 40. 'Throat catarrh' for many years. In the left nostril crusted pus sticking to the middle turbinal.

Close by, attached to its anterior end, a lobulated polypus. The pus came from the middle meatus. There was no disease of bone.

53. M. M., 31. Profuse suppuration on both sides for last four years. Nasal obstruction for the last year. Many polypi removed by Professor X. in A. Never examined with the probe. Both sides stuffed with polypi of the middle turbinals, from the size of a bean to that of a hazel-nut. Close to the polypi the probe everywhere entered cavities—open and suppurating ethmoidal cells. In addition, empyema of the right antrum.

To sum up the results of these fifty-three cases in which polypi were observed :

In forty-three focal suppuration was demonstrated to be present; only six had certainly no abnormal secretion, and four cases may in strictness be left out, because, although abnormal secretion was present, its source could not be certainly determined. Of my earlier series of thirty-three cases of polypus, only five were free from coincident focal suppuration. Thus, of eighty-two persons suffering from polypus, seventy-one were certainly the subjects of focal suppuration—86 per cent.

Of these 71 patients, we find—

- 9 with antral empyema (3 bilateral).
- 1 with antral catarrh.
- 20 with ethmoidal empyema (6 bilateral).
- 10 with suppuration of the meatūs—7 with bone disease, and of these 3 bilateral.
- 1 with sphenoidal empyema.
- 30 with combined empyemata, as follows :
 - 6 ethmoid and antrum (4 bilateral).
 - (In 2 this combination was not certainly established.)
 - 1 ethmoid and frontal sinus.
 - 8 ethmoid and sphenoidal sinus.
 - 3 ethmoid, sphenoid, and antrum.
 - 3 ethmoid, antrum, and frontal sinus (1 bilateral).
 - 2 with ethmoid, antrum, frontal, and sphenoidal sinus.
 - 1 with right ethmoid and antrum, and both frontal sinuses.
 - 1 with right sphenoidal sinus, frontal sinus and antrum on both sides.

1 with left frontal sinus, ethmoid and sphenoidal sinus on both sides.

1 with left sphenoidal sinus, ethmoid both sides.

1 with left frontal sinus, right ethmoid antrum and sphenoidal sinus.

Of the 11 cases without abnormal secretion—

In 1 the tumour sprang from a syphilitic base close to an old ulceration.

In 1 there was congenital atresia of the choana with retention of secretion.

In 2 the ethmoidal cells were involved in the tumour formation without obvious cause.

In the 7 remaining cases no obvious cause could be found.

In these last cases one is driven to the assumption that the growths were induced by a minimal amount of irritation, and this assumption receives some support from experience, which shows that in pyogenous polypi there are great variations as regards rapidity and extent of growth, and tendency to recurrence—variations which cannot well be explained otherwise than by a more or less pronounced tendency to tumour formation.

The two cases of polypi in children under fifteen years of age are particularly interesting. They are the only two cases I have as yet had, and both were due to suppuration in the accessory cavities. (In one case the diagnosis was very difficult, and was only established after three exploratory punctures.)

With regard to the association of polypus with empyema in the cases described above, it should be noted that where the one affection was unilateral, so was the other; and where the one affection was bilateral, so was the other. To this there was only one exception, and the circumstance is instructive. Its significance is not affected by the fact that Jeanty⁽²⁸⁾ observed four times bilateral polypus formation associated with disease of one antrum, for he seems to have confined his attention to empyema of the antrum, without strictly excluding suppuration of other accessory cavities.

If we set aside the combined empyemata, we find that ethmoidal suppuration supplies the largest contingent of

polypoid diseases, and this is not surprising in view of Zuckerkandl's anatomical confirmation of clinical experience that polypi most frequently have their roots in the ethmoid.

They grow most frequently from the middle turbinal, but they also occur on the roof of the nose (Cases 16, 36, and 40). According to Zuckerkandl⁽³⁷⁾, this is not so: 'I have never seen polypi springing from the roof of the nose or the lamina cribrosa, as some authors describe. It is, of course, not impossible that it may occur; but there is as yet no proof of it. Petrequin's assertion is not worthy of much notice, for it is not based upon anatomical observation. I have not had such a case (polypus of upper nasal wall) amongst 300 dissections.'

This is certainly pretty strong! Fortunately, it need not be taken quite literally, for on referring to the same author (vol. ii., p. 79) nine months earlier, we read: 'As new I must mention several cases where the base of the tumour extended to the roof of the nose (bridge of the nose, lamina cribrosa).' As proofs of this occurrence (which so soon afterwards escaped his memory), our author then mentions three cases on pp. 79 to 81 and 139 (Case 2), with drawings on Plate V., Figs. 4 and 5.

The frequent juxtaposition of polypi and chronic empyemata gives us an indication as to which was the primary condition, and gave rise to the other. Thus, if we find amongst 220 patients with focal suppuration over one-third affected with polypi, and, on the other hand, amongst eighty-two cases of polypus only eleven which are free from focal suppuration, it is quite evident that the polypi cannot be considered accidental, but that a causal relationship exists between them and the suppuration. And this relationship can only be that the polypi are caused by the chronic suppuration.

If the reverse were true, it would be incomprehensible why in certain cases polypi occur without suppuration. The suppuration would have to be considered as a retention suppuration, and could only be absent when there was a passage for air through the nose. But in four of my 'pure' cases of polypus the nose was absolutely blocked, and yet there was no suppuration.

I have no doubt that the following is a frequent occurrence.

A chronic empyema of one of the accessory cavities causes growths in the nose, the passage for air is diminished or stopped, and, in consequence of this, in blowing the nose infectious pus is driven into one or other cavity, not yet diseased, and sets up suppuration in it. Some of the combined empyemata may no doubt be explained by such auto-infection.

That a combined empyema may arise without previous independent disease of at least one of the accessory cavities is not yet proved. But it needs no negative proof. The histological structure of gelatinous polypi; the fact that they are composed of, or infiltrated with, little round cells; the way in which especially the vessels and glands are surrounded by such little round cells; finally, the continuous connection of the growths with the basal submucosa or periosteum, indicate to us their inflammatory origin. In this interpretation I entirely agree with Zuckerkandl.

This inflammatory character comes out very distinctly when one considers what Suchanek⁽⁹⁵⁾ found in acute catarrhal inflammation of the mucosa. Here, as in the former case, there was the same picture of 'areolar connective tissue with wide, serum-filled meshes, strikingly large, filled with finely-granular material, partly exudation': acute inflammatory œdema, practically indistinguishable from the chronic process as it presents itself to us in gelatinous polypi.

Macroscopically in the living body there is no difference to be found between acute and chronic inflammatory œdema. Chance threw in my way a rare case which illustrates this analogy in a remarkable way.

Case 96.—Both antra had been opened and firmly plugged. Not the slightest trace of tumour formation had been observable in the nose beforehand, but the very next day in both nostrils a gray, shining, movable, polypus-like tumour appeared on the lower edge of the hiatus semilunaris. The plugs were removed. Next day the left tumour was entirely gone and the right almost so. The last trace of it soon disappeared.

Here we had an acute development of gelatinous polypi from inflammatory œdema, reinforced by the stasis due to the plugs.

These facts help to explain the origin of polypi from inflammatory irritation (under which head we include suppuration),

and clinical experience points in the most definite way to the fact that where suppuration exists the polypi are always secondary to it.

Thus, in one case I was able to diagnose an empyema of the antrum complicated with the development of polypi. The growths were 'radically' removed. Six months later they had reappeared on the same spot, the lower lip of the ostium maxillare.

In another case I found lobulated hypertrophies of the lower turbinals on both sides. They were removed. Two years later there were polypi in both middle meatūs. The possible existence of empyema was now considered, and inquired into, and established, although there were no other leading symptoms, and the patient denied that there was any purulent discharge, as most of it found its way into the throat, and the rest he thought was merely normal secretion. There was severe fœtid suppuration in both antra, both sides of the ethmoid labyrinth, and both sphenoidal sinuses, and it was evident from the history that the suppuration dated back five or six years, so that the polypi did not appear in this case till five years after the empyema.

Further, I have three times had the opportunity of directly observing the springing up of polypi during the course of empyema.

In other cases of a very chronic nature, it was apparent from the small size of the polypi that they had first appeared late in the course of the disease, and this no doubt explains why one sees comparatively so many cases of empyema without polypi.

Finally, a careful inquiry into the history of twenty-two cases showed that a discharge of pus from the nose had existed for a very long time before there was any nasal obstruction. In several cases nasal obstruction had only come on after ten or twenty years of nasal suppuration.

The counter-proof of this supposed relation of empyema to polypi has been furnished by the fact that polypi which had recurred for years after removal have been permanently cured by the treatment of the empyema.

The following propositions, I think, we may consider as proved :

1. A great majority of the cases of nasal polypi occur in connection with focal suppuration.

2. Where suppurative lesions are present, these are exclusively the cause of the growths; but the opposite of this is not true, apart from cases of secondary infection of other cavities in the course of an empyema which is already present.

This interpretation may appear almost self-evident, especially when one considers how easily it explains the liability to recurrence of nasal polypi, yet it seems to me necessary to give in this place the facts upon which it rests, on account of the contradictory or doubtful attitude of many authors on this question. I may mention Bayer⁽¹⁴⁵⁾, Schäffer⁽⁸¹⁾, Moldenhauer⁽⁸³⁾, Killian⁽³⁰⁾, Heryng⁽¹⁴⁷⁾, Ruault⁽¹⁴⁸⁾, Bosworth⁽⁶⁶⁾, and many others.

When Woakes maintains that he has never seen a case of nasal polypus in which he could not find necrosis, he is contradicted by my experience as detailed above, but only in part. It is decidedly a one-sided view to refer all polypi to ethmoidal disease, seeing that other empyemata and focal suppurations are just as potent in causing them; in the same way, Woakes's statement that he has seldom seen a normal middle turbinal can only be characterized as an incomprehensible exaggeration.

At the other extreme is Zuckerkandl's⁽³⁷⁾ assertion that he 'never saw caries or necrosis of the ethmoid associated with polypi except in syphilitic or tubercular cases.' This can only be considered as a regrettable *lapsus memoriæ*, seeing that the same author in a previous passage of his book, describing a case of the kind, throws doubt upon its syphilitic nature. The case is described in vol. ii., p. 82, and figured in Plate VI., Fig. 1. It shows a polypus springing from the lateral wall of the sphenoidal sinus, and firmly adherent to the edge of the ostium sphenoidale, and also an ulcer on the mesial surface of the middle turbinal. 'In the base of the ulcer are fragments of dead bone, and the adjacent part of the spongy bone is thickened.' Zuckerkandl's description of this case as 'syphilitic' (though he is uncertain of its accuracy) probably rests partly upon the (to him) unusual appearance of the ulcer of bone, and partly upon the fact that there is a puckered, tendinous-looking cicatrix in front of the middle turbinal. I am no more certain

than Zuckerkandl that the lesions are syphilitic. On the contrary, I have never yet seen a nasal polypus close to a vascular ulcer, and I have had considerable experience. On one single occasion I observed a firm, somewhat gelatinous, broad-based swelling (hardly perhaps to be called a polypus) close to an old loss of substance. I know of no observations on polypi in nasal syphilis, apart from the growths which form round pieces of dead bone, and they differ widely, both in appearance and consistence, from real polypi. But the picture in Zuckerkandl's case is easily explained, if one assumes an antecedent sphenoidal empyema. For the development of a polypus, and more particularly the ulceration on the inner side of the middle turbinal (where secretion from the sphenoidal sinus gathers), are by no means unusual according to clinical experience, and the cicatrix might just as well result from the removal of a polypus as from ulceration. The radiating appearance of the cicatrix is not at all characteristic of ulceration, for I have often seen such scars both in the nose and the larynx, both after my own operations and those of others. One feels very much the want of the clinical history of Zuckerkandl's preparations, in interpreting such cases as the one under consideration.

The relation which **hypertrophies** of the mucosa bear to empyemata, is somewhat similar to that of polypi, but not so close. Hypertrophies agree with polypi in that they are sometimes caused by empyemata, and their anatomical form is liable to the greatest variations, from a simple broadening or general enlargement of the end of one of the turbinals, to the formation of pendulous flaps. One cannot, however, say of hypertrophies, as one can of polypi, that their occurrence is connected essentially with disease of the deeper parts of the nose. The papillary and flap-like hypertrophies seem indeed to be for the most part quite independent of suppuration; the nasal secretion is often diminished, and rarely purulent. In forty cases of empyema in which hypertrophies were present, I have not once seen the papillary or flap-like form, and in only four was it possible to remove anything with the galvano-caustic snare.

In fourteen cases polypi were present along with the hypertrophies; in ten there were hypertrophies alone. It is worth noting that the last-mentioned cases were due exclusively to

ethmoidal empyema, complicated in three cases with sphenoidal suppuration. Further, in four of the cases there were recurring hypertrophies, and it was this fact of recurrence that first directed my attention to the real disease.

This was especially true in one case. A railway stoker, aged 51, had suffered for years from hypertrophy of the right lower turbinal, which blocked the nostril in front. When this was removed with the galvano-cautery, the discharge, which was somewhat purulent, ceased, but the flattened hypertrophies kept recurring, till I discovered at last that there was caries of the most anterior ethmoidal cell. The little carious cavity having been scraped out, the discharge soon ceased, and the hypertrophy recurred no more.

Thus, the presence of hypertrophy, especially recurrent hypertrophy, of the anterior ends of the turbinals, whether accompanied by increased secretion or not, ought to direct one's attention to the ethmoidal cells. The case is still more suspicious if—in addition to nasal obstruction—the patient complain of headache, heaviness, or dulness in the head, etc., which latter symptoms are not uncommon in cases of hypertrophy, and may often be successfully traced to focal disease of the deeper parts of the nose.

Let me here mention the so-called 'lateral swelling' of the mucous membrane, as described by Kaufmann⁽¹⁴⁹⁾. It is simply a hypertrophy of the lower lip of the hiatus semilunaris, and was previously observed and described by Hartmann and Schech as an apparent duplication of the middle turbinal ('cleavage of the middle turbinal'—Woakes). Kaufmann lays special stress upon its presence in the diagnosis of empyema of the antrum; and, as a matter of fact, it is frequently seen in that condition. The absence of this swelling, however, must not be taken as evidence that there is no pus in the antrum, for amongst my ninety-eight cases it was only present in a few; and, on the other hand, its presence does not indicate with any certainty the existence of empyema. Kaufmann observed it once where there was no empyema, and I can confirm this from my own experience in several cases.

Inflammatory new formations of this sort are not rare, and occur, generally in the recurrent form, not far from suppurative

lesions of the nose. They are of a tolerably bright red colour, granular aspect, and soft consistence (on the surface, at least), and give one the impression of ordinary granulations. In reality, however, as I have found from repeated microscopic examinations, they consist not only of small-celled tissue, but of growths of all the elements of the mucosa, including the epithelium, with which they are uniformly covered. Betraying their inflammatory origin plainly enough by cellular infiltration round the vessels and glands, they form a histological transition or bridge to the true gelatinous polypi, in the development of which they may be considered an early stage. The tendency to recur after removal is common to, and distinctive of, both forms of growth. Finally, congestion of the erectile tissues of the nose, on the lower turbinal and elsewhere, will well repay attention. Obstinate conditions of this kind depend very often indeed upon deep-seated foci of inflammation, especially upon antral empyema. This is well worth bearing in mind.

In flowing out of the nose pus infects neighbouring parts. Let us next consider the action on the

IV. Skin.

Eczema of the upper lip and alæ nasi is almost pathognomonic of the existence of that form of nasal suppuration which is due to enlargement of the pharyngeal tonsil. In children I have never seen the one without the other. The eczema disappears quickly after removal of the growths.

In adults, especially in men who wear a moustache, a still more obstinate inflammation occurs in the hair follicles of the upper lip or entrance of the nostril—a true **sycosis**. When the affection is limited to the region immediately below the nostrils, one may safely assume that it is due to some intranasal inflammation; and any treatment which does not take account of this cause will be mere trifling.

That secondary suppurative folliculitis should occur in this way is intelligible. The primary forms will be described further on.

Not unfrequently pus is conveyed from the nose by the

fingers to the sebaceous glands of the face, causing **acne**; and **erythema** of the cheek and nose may be similarly produced, so that these affections point in some cases to deep-seated inflammations.

In this place may be mentioned that remarkable phenomenon **subcutaneous emphysema**. Fractures of the walls of such accessory cavities as lie subcutaneously allow of the escape of some of the expiratory air.

We have several times seen the cheek and the eyelids blown up with air in this way, in consequence either of spontaneous or operative rupture of the outer wall of the antrum; and Pineau⁽⁹⁾ reports a case of general subcutaneous emphysema caused by a frontal empyema.

As the skin in the neighbourhood of the nose is affected by nasal suppuration, so also are the

V. Mucous Membranes,

but much more frequently, and sometimes in a way which is almost quite characteristic.

Even in the mouth the action begins.

Leukoplakia, that obscure affection of the tongue and mucous membrane of the cheek, results from various forms of irritation, amongst which constant contact with pus is not the least.

Without underestimating the importance of diseased teeth, irritation by sharp teeth, stomach disorders—especially those in which the secretion of acid is increased or altered—excessive smoking, highly spiced viands, or, finally, the special predisposition which is apparently peculiar to old syphilitic cases—I say, without underestimating any of these things, it is yet remarkable how often, as soon as attention was directed to the subject, the picture of leukoplakia was complicated with nasal suppuration.

The presence of the one condition ought to make us look for the other. The importance of suppuration in causing leukoplakia cannot any longer be overlooked, and the indication for treatment is to remove this and every other possible source of irritation.

That the teeth of the upper jaw may become secondarily diseased in empyema of the antrum is possible; so much I may say from my own experience; that it is a usual occurrence, as Zuckerkandl maintains, I cannot admit. In fact, I am quite certain that it is not. In the cases which seemed to me suspicious, the teeth dropped out painlessly. With regard to affections of the deeper parts of the alimentary and respiratory tracts, we have **naso-pharyngitis, pharyngitis, and laryngitis sicca**, to mention only the most important. These conditions have long been known, but their mode of origin and essential nature have only very recently been correctly estimated.

Ziem was the only author who pointed out that the so-called Tornwaldt's disease very often depends upon nasal suppuration, and not upon suppuration in the recesses of the pharyngeal tonsil.

My own experience supports this view.

In cases of this kind I have several times seen in the recesses of the vault collections of mucus and crusts, which were not due to inflammation there, but came from farther forward in the nose.

However often one may find a significant mass of mucus or pus lodged on the same part of the vault in a recess of the adenoid tissue, one has no right to conclude from that alone that the recess in question is the true and only seat of disease. I must admit that in not a few cases suitable local treatment of this part quickly and permanently cures the discharge. In other cases, however, and that not rarely, the typical repeated lodgment of secretion in this position is due to the fact that discharge from one of the accessory cavities of the nose (preferably the sphenoidal sinus) naturally gravitates to this spot. (For details see the section on symptomatology.) Pus from other cavities, too, sometimes chooses this mode of exit, and I have even seen pus from the maxillary antrum almost or quite exclusively take this route.

Finally, it must not be forgotten that a very obstinate inflammation of the recesses of the vault of the pharynx, (Luschka's tonsil) may be set up by the continual trickling over them of pus from other parts; and it by no means follows that

this inflammation will resolve spontaneously after the empyema is cured.

This relation is more strikingly confirmed in cases of 'dry catarrh,' both when it affects the fornix and the posterior wall. Since my attention has been directed to this subject, I have never yet found that the well-known thin layer of tough secretion, which covers the thin, shining, leather-like mucous membrane, originates in this mucous membrane. It always comes from above, and in this observation I am glad to say I am confirmed by Moritz-Schmidt. The peculiar atrophy of the mucosa is invariably the consequence of **irrigation** with pus, so to speak. If the source of the pus, which lies higher up, be found and removed (often a very troublesome business), the varnish-like secretion, which apparently proceeds from the mucous membrane of the throat, vanishes completely.

It is not frequent to find these changes in the throat alone, without implication of the deeper parts—to wit, the larynx. To the larynx the patient often refers most of his complaints, so that the pharyngeal symptoms are often little regarded by the patient and easily overlooked by the doctor. **And yet no examination of a patient with chronic laryngeal symptoms can be regarded as complete till the exact condition of the nose and naso-pharynx is made out.**

Michel relates that his patients were often astonished on being told that their disease was in the nose, while they had come to him complaining of the throat; and the practitioner should lose no opportunity of convincing himself that this relation is not only frequent, but almost the rule.

Here, again, I must make bold to assume that the same errors which I was taught to respect, are still cherished by many colleagues. When one comes across old cases, which, years before, one had registered and treated according to the old methods, and when one sees now in the light of fuller knowledge that these cases are affected with suppurative disease higher up, which at once enables one to demonstrate the secondary character of those deeper-lying diseases, one will perhaps be more inclined to recognise as error what one has been obliged to correct in one's self, and to admit such a possibility in other cases of insufficient observation.

In the throat, **granular** and **hypertrophic pharyngitis** must still be considered. Not unfrequently I have observed these forms of inflammation to be caused by morbid secretions in consequence of enlargement of the pharyngeal tonsil. The secretion was, it is true, not always purulent, but the observations may be included under the same head. The impression I got was, as a rule, that the frequent retching and clearing of the throat had more to do with producing the changes than the irrigation of the mucosa with morbid secretions. Certain it is, that one may save one's self much useless labour in the treatment of these troublesome conditions by bearing in mind their relation to the nose and the pharyngeal tonsil. I have several times observed that the throat troubles, which were formerly described as reflex paræsthesiæ, and in which local treatment was deprecated, may arise, not only in consequence of such obvious diseases of the pharynx, but also, in the absence of any visible change, from irrigation with pus from the nose. Again, the troubles which have been referred to disease of the lingual tonsil (of which, I think, too much has lately been made) need not hinder the observer from careful inspection of the upper air-tract, where, judging from my own experience, he will often find a definite morbid condition in cases where, judging from the symptoms, one would have expected to find the disease lower down.

Defects of voice in throat catarrh (pharyngitis) have hitherto been attributed partly to fatigue of the laryngeal muscles from the vigorous and often almost incessant clearing of the throat, and partly to disturbances of resonance due to the irregular swelling of the pharyngeal walls and the defective action of the pharyngeal muscles. This explanation is no doubt quite correct, but I have also repeatedly observed in such cases a direct injury of the mucous membrane of the larynx by the trickling down of pus from the nose. The changes so produced differed from those seen in an ordinary catarrh spreading down from above. In the latter case the interior of the larynx is dusky red, often swollen, and the cords themselves are frequently transformed into reddened swellings. In the cases due to the trickling down of pus, on the other hand, I observed that the whole mucous membrane was rather paler than usual and

somewhat uneven, the cords themselves were discoloured, grayish - white or grayish - red, with irregular surface and uneven edges, giving one the impression not so much of chronic inflammation, as of maceration of the epithelial surface. These appearances are no doubt produced by continual contact with decomposing pus which trickles down from above, and the proof of this is completed by the observation that the changes in the larynx disappear without any local treatment when the nasal suppuration is cured.

Not less characteristic is crust formation in the larynx, the so-called **laryngitis sicca**. It may perhaps occur in scleroma as a real laryngeal affection, the crusts being formed of laryngeal secretion produced on the spot, but as a rule the crusts are formed of secretion which trickles down from above. The changes observed by me in the larynx have always been inflammatory, never secretory. This was rendered evident by leaving the larynx entirely untreated; the laryngeal signs disappeared as soon as the nasal suppuration was cured or improved.

A few illustrative cases out of a large number may be here introduced :

CASES 99, 100.

Laryngitis Sicca due to Nasal Suppuration.

1. Mrs. K. F., aged 34, has been hoarse for many years, and repeatedly quite voiceless. Complains now of complete aphonia of three weeks' duration.

Vocal cords moderately reddened, and covered posteriorly with firmly adherent crusts, making complete adduction impossible. Throat dry, mucosa very thin, fornix free, crusted pus in the choanæ. In the nose, which appears very wide, a quantity of fœtid crusts (originating in bilateral empyemata of the middle ethmoidal cells and antra). Under surgical treatment of the nose fœtor disappeared permanently from the crusts in twelve days; the voice became quite clear (and continued so for several months) as soon as pus ceased to flow backwards through the posterior nares and all came by the front (identical with Case 11, p. 65).

2. Mrs. K. K., aged 40, sent for me on account of threatened suffocation. The patient was sitting upright, breathing noisily and with difficulty, which was explained by the fact that the

larynx was blocked with greenish - gray crusts. When she retched, one saw behind the uvula a greenish-yellow mass. In the nose there was a quantity of pus, partly liquid, partly dried, and the probe showed extensive loss of substance in the region of the middle ethmoidal cells. As the woman was advanced in pregnancy, the nose was simply kept carefully cleansed by sniffing up a lotion, which prevented further crust formation in the larynx.

Another form of chronic disease of the larynx, in the production of which nasal suppuration has hitherto not been regarded, is the so-called **pachydermia**. I have seen cases of this affection in consequence of nasal suppuration, cases which were typical, both as regards localization and form, as described by Virchow on the vocal cords, and also in other parts of the larynx. In one case the cause was excessive secretion from adenoid vegetations; in another the picture resembled tuberculosis.

CASE 101.

Pachydermia of the Larynx due to Nasal Suppuration.

A. B., male, aged 39, has been hoarse since puberty, and on that account was dismissed from military service. His father died of phthisis. Has lost strength of late, and suffers from a cough, with tough, scanty expectoration. His doctor sent him to me as a case of tuberculosis in August, 1891.

Percussion of the lungs showed slight shortening of the note at the right apex; rough breathing under the clavicle on both sides. In the larynx, on the left side of the posterior wall, there was a pyramid-shaped swelling, pale red and slightly uneven; the vocal cords were grayish-red, uneven, and relaxed, the left false cord was thickened in front. I 'confirmed' the diagnosis of my colleague. I never examined the upper air-tract.

In December, 1893, the patient returned in robust health, and with exactly the same condition in the larynx as before. I now noticed a sweetish foetid odour proceeding from the nose. This I remembered I had formerly remarked, but I thought it was the smell of snuff. On inquiry, it appeared that for years he had had much 'phlegm' from the throat, and for the last eighteen months the nose had been obstructed by crusts. In addition to this, there had been severe pain over the right eye and in the occiput for the last year.

It is only necessary to add that the man was perfectly sound

except for the existence of sphenoidal empyema on both sides. This was finally taken in hand, and the voice improved without any treatment of the larynx.

An obvious objection to the view that the above-mentioned affections depend upon nasal suppuration is, that local treatment of them has not been unsuccessful. It is perfectly true that these 'catarrhs' are improved by mild local treatment of the throat and larynx, which liquefies or removes mechanically the tough secretion that has lodged upon the parts. For instance, by preventing the formation of pockets in the adenoid tissue of the pharyngeal tonsil, one may remove the tormenting retching and hawking which is caused by the retention of secretion in recesses of the mucosa, and cause it to be replaced by easy expectoration. Thus are produced apparent cures, nowhere so frequent as in diseases of mucous membranes, satisfying patients and deceiving doctors, who often never see their patients again, or only after long years have elapsed.

When one has learned from frequent experience that patients with extensive suppuration in the nasal accessory cavities complain only of trouble in the throat, one ceases to be surprised at it.

The following case illustrates the importance of treatment directed to the throat :

CASE 102.

Multiple Empyemata in Process of Cure, with Crust Formation due to Adenoid Vegetations.

There was empyema of all the accessory cavities on the left side. All were healed except the sphenoidal sinus, which still discharged a little pus. On the posterior pharyngeal wall little crusts were still formed, and these proved exceedingly troublesome by giving rise to severe attacks of asthma till they were dislodged. At last it was discovered that these crusts were always formed in the fornix of the diseased side behind a mass of adenoid vegetations. The removal of this 'adenoid' mass at once cured the crust formation.

A second exactly similar case only requires to be mentioned.

Not a few of the most important symptoms arising in consequence of nasal suppuration may be grouped under the heading—

VI. Subjective Disturbances.

Disorders of feeling, and also, though less frequently, of perception, are quite frequent, and assume such importance in the mind of the patient, as well as in the judgment of the doctor, that they are elevated to the rank of independent 'idiopathic' diseases. Considering the zeal with which each speciality claims as its own the most important diseases to which man is heir, it is not surprising that only the most trivial symptoms are left as undisputed property. 'The relation of each particular "ology" to the general condition' is the modern phrase used in describing the process.

So much by way of introduction.

Disorders of Taste and Smell.—Abolition of the sense of smell cannot, according to my experience, be associated with suppuration of any particular region. Observers sometimes interest themselves in arranging osmometric data with regard to empyema of the various sinuses. For my part, I must confess I know nothing about it.

Neither is the kind of suppuration any criterion. As a rule, it is maintained that in 'ozæna' the sense of smell is abolished. Nevertheless, I have observed cases in which it was retained.

It is remarkable how in many cases the sense of smell is quite abolished, whilst in others, where the disease is perhaps more severe, it is hardly injured at all. The fact that the anosmia has always disappeared with the cessation of suppuration (whatever the situation of the suppuration might be) has convinced me that the loss of smell does not depend either upon direct anatomical injury of the olfactory mucous membrane, or upon the fact that it is shut off from the air-stream by swellings, etc. In many cases it is rather the pus itself that injures the sense of smell. For example, in one case of ozæna in which I had to operate very extensively upon one nostril with forceps and sharp spoon, it was quite striking to observe how the sense of smell (which had been quite absent for at least twenty years) returned when the foetid suppuration was cured. This was true also of the other nostril, which was not

diseased, but through which crusts from the diseased side had been continually expelled.

Farther, in cases of recurring suppuration of the antrum, ethmoid, etc., the recovered sense of smell disappeared at once as suppuration was re-established, and gradually returned again as the suppuration improved.

In another case, smell was little affected, although there was bilateral empyema of all the cavities except the frontal sinus. The pus, however, almost always flowed backwards into the throat, and very rarely forwards into the nose. As polypi and diseased bone were removed in the course of treatment, a way was opened for the pus to flow forward, and the quantity of discharge was increased by the large wounded surface. The sense of smell then disappeared entirely. Later, as the discharge diminished, it gradually reappeared, with fluctuations which corresponded exactly with the fluctuating course of the cure. It may perhaps be objected to these cases that the absence of smell was due to the air being unable to reach the olfactory region of the nose, by reason of the swelling of parts in connection with the suppuration. This, however, was not so. The extensive loss of substance from disease and operation made it quite impossible; and, besides, I gave particular attention to this point in every case, and am certain that such an explanation was quite out of the question.

Of course, this explanation only holds good for the majority of those cases in which the sense of smell was recovered. Where the anosmia is complete and permanent (the rarest of all cases) there must either be a central change, or anatomical damage to the peripheral perceptive organs. Some of the curable disturbances will, of course, be due to mechanical causes.

Parosmia I have not observed in chronic cases, but I have seen it in a pronounced form in acute cases, and it was remarkable that the olfactory hallucination remained the same in different recurrences.

That the **sense of taste** should share in these disturbances (ageusia and parageusia) is a matter of course, seeing that the finer specific sensations of taste depend really upon perceptions of smell.

Disturbances of the sense of Sight

are chiefly subjective. (Inflammation of the eye, the orbit, etc., will be discussed farther on.)

Scotomata are undoubtedly present in many cases—not constantly, but at times. As a rule, they come on in fits or paroxysms, with or without flickering.

Patients rarely complain of them. I have seen a few cases—perhaps half a dozen—in which this symptom was due to deep-seated suppuration in the nose, generally of the accessory cavities. Scotomata are closely connected with headache, often one-sided, but the nasal disease which gives rise to them is not necessarily suppurative. Unfortunately, I cannot go fully into this question here, and will only remark that the ‘migraine ophthalmique,’ which is symptomatic of nasal suppuration, or nasal disease generally, is undistinguishable from the ‘idiopathic migraine’ of the neurologist, or from that seen in other diseases, *e.g.*, in the early stage of progressive paralysis.

Another form of visual defect, viz., the **contraction of the field of vision**, demands more detailed consideration.

Ziem has published a number of facts which are said to prove that there is frequently a diminution of the visual field, especially in empyema of the antrum. He seeks to explain this by disturbances of the circulation between the nose and the eye, by which the ciliary body is injured.

Without going into a detailed criticism of Ziem’s observations and deductions, I may say that I have not been able to confirm them in my own cases, and in this I am supported by a good many other authors.

On the other hand, Kuhnt (⁷⁷) describes similar conditions, and lays particular stress on the concentric contraction of the visual field for red and green. His experiences were mixed, and derived chiefly from frontal empyema. In spite of the fact that the most trifling alterations were noted—many of them within the limits of possible error—he found in seventeen cases twelve which were quite normal, and only five showing contraction of the field, in some cases quite insignificant.

I have had a number of my cases—some unselected and some suspicious cases—examined by an ophthalmic surgeon, Dr. Rhein, but always with a negative result.

Once I thought I had at last hit upon what I had been looking for. A female patient, upon whom I had operated under an anæsthetic for ethmoidal and sphenoidal empyema, complained for several days of defective sight on the left side. She said she saw everything to the left of the middle line black. I closed her right eye, and, bringing my hand over from the left side, asked her if she saw it. 'Yes,' she replied; 'I see it, but it is black!' I assured her that if she only saw black we were quite content. The perimetric chart in this case was quite normal.

How it comes about that Ziem should have adduced so many positive results in this matter, it is hard to say.

I may just refer to the analogous question, lately much discussed, of concentric contraction of the field of vision in traumatic neuroses. Very positive results are announced by the one set of observers, and just as positively denied by the other. Schmidt-Rimpler (¹⁵⁰) lately made some interesting remarks upon this dispute. He thinks that a misunderstanding on the part of the patient at the beginning of the perimetric examination may give rise to simulation afterwards: in this way. The patient at first really believes that he is to say 'Now' when the little square of paper which is moved inwards from the periphery appears distinctly to him as a square of paper, and the astonishment (and perhaps delight) of the examiner at such a marked concentric contraction of the visual field gives him the 'tip,' so to speak, to stick to his results. The observer is deceived, but no deception is intended by the patient—at first, at all events.

(A case of Engelmann's (⁵⁹) is instructive in this connection. There was suspicion of catarrh of the frontal sinus of one side, and on the same side marked contraction of the visual field, and some hyperæmia of the fundus. Next day, on repeating the examination, the visual field was normal. The patient had proved extremely awkward, so that doubt was thrown upon the correctness of the first result.) I have mentioned this here, not because I suppose a practised observer like Ziem

would be misled by any such misunderstanding, but because it shows so plainly the merely relative value of a method of examination which depends essentially upon the subjective statements of the patient. If one could really rely upon the patients (acquitting them of any wish to deceive), this, and many another question, would be easy of solution.

It must always be remembered, however, that the discovery of defects is really only a negative result. Positive results, such as the demonstration of a complete field of vision, are always much more convincing, for a positive perimetric result can neither be simulated nor suggested.

Although I have not succeeded in discovering any objective changes in the eyes in this direction, I will direct your attention to certain subjective disturbances of sight, which may best be described as **asthenopic troubles**.

A large number of patients with diseases of the upper accessory cavities have complained to me of defective sight. (As it happens, not one of them was suffering from suppuration of the antrum alone.) They complained not only that reading and other near work strained and tired the eyes, but also that the outlines of objects seemed to run together, and that distant vision was indistinct.

It is well known how frequently chronic nasal affections are associated with obstruction in the lachrymal passages and conjunctiva. The eye being covered with a thicker layer of moisture, objects are seen as through a veil, and the patient may get the erroneous impression that there is a real diminution in the acuteness of vision.

In other cases, however, where there was no question of lachrymal irritation, and especially in cases of ethmoidal suppuration, the same complaint was made, so that one could not but think that the receiving parts of the eye must be involved, especially as in unilateral empyema the eye of the same side was complained of. In several cases I had the eyes most carefully examined by Dr. Rhein, but the result was negative. No objective change was to be found, and refraction, accommodation, and acuity of vision were perfectly normal.

But it was obvious that there must be some truth in the complaints, for most of them were made spontaneously, not in reply to questions; and it is also known that after operations on the nose, especially when the plug is used, there is often pronounced congestion of the eye, with impairment of vision. I believe the explanation to be as follows: the suppurative process going on close to the base of the skull, and often close to the optic nerve, sets up an irritative hyperæmia in the neighbourhood of that nerve. Every effort which brings more blood to the brain must increase this condition of irritation. Especially every effort of the eye, and, most of all, every effort of accommodation, must increase the blood-supply, and consequently increase the feeling of discomfort and strain in the eye. This may be counteracted by distracting the attention, as much as possible, from the object, by an unconscious action of the will against its fixation. The object thus becomes indefinite; it is regarded, perhaps, along a varying line of sight, perhaps with purposely insufficient accommodation; and it thus appears blurred, to the mind's eye at least, if not to the bodily vision. It is, of course, different with the surgeon's examination. There, the attention is sufficiently strained (in spite of the resulting discomfort) not to prejudice the normal construction of the eye. There may thus be a 'psychical asthenopia,' and also a 'psychical contraction of the visual field,' inasmuch as the patient instinctively and unconsciously avoids the eye-strain and discomfort involved in the exact vision of certain objects.

If one forbears to tire and strain the attention of the patient in the particular direction in which the effort gives rise to discomfort, one will escape being deceived by replies which are dictated more by disinclination than strict regard for truth. Kuhnt⁽⁷⁷⁾ objects to my attempted explanation, founding his objection upon opinions which I have never expressed. He quotes me as speaking of a 'hyperæmia in the most posterior part of the optic nerve,' a thing I have never even mentioned. I have purposely confined myself within the wide bounds of general pathological processes, seeing that everything I have advanced is not anatomically proved. Kuhnt himself admits 'that hyperæmia in the radicles of the ophthalmic vein is

not only possible, but even probable,' in inflammation of the mucous membrane of the accessory cavities. Is it, then, unknown to the ophthalmologists that the central vein of the retina belongs to the district of origin of the superior ophthalmic vein?

If Kuhnt speaks of my explanation of asthenopia as 'quite too daring,' what description shall fit his own theory, according to which physiological astigmatism and slight degrees of hypermetropia, as well as dilatation of the pupil from sensory stimuli, are said to render distant vision indistinct? (The difficulty of near vision described by me is not mentioned.)

Has the ophthalmologist still to learn that physiological astigmatism is so called because it gives rise to no trouble? that when I write 'refraction normal,' this denotes emmetropia, and not hypermetropia? that dilatation of the pupil and keenness of vision have nothing to do with each other, apart from the fact that the former was not observed in our cases? However shaky or plausible Kuhnt's 'explanation' may be, it stands in need above everything of some foundation on fact. And so he says himself: 'In my patients I was at least able in every case to fix upon one of the points adduced, as being very probably the cause of the disturbance.'

The actual value of this assertion is more easily estimated after reading the following quotations from Kuhnt's histories of cases:

'Case 8, p. 236.—Asthenopic symptoms; eyes moderately myopic; central vision and colour sensation normal. Visual field decidedly diminished concentrically for white and reddish-green, but cannot be exactly estimated. Pupil reacts promptly. Papillæ almost normal, only slightly hyperæmic.'

'Case 9, pp. 238, 239.—Had trouble in bringing the letters together distinctly. Later, double vision through dislocatio bulbi. The functions of the eye itself perfectly normal; similarly the objective conditions.'

Sapienti sat.

It is sufficient to know that Kuhnt also has confirmed the fact of asthenopia in empyema, as Caldwell (¹⁵¹) did before him.

Much more serious than the above are the troubles included under the name of **headaches**, to which the asthenopia is often only a sort of preliminary. The views on the subject of headache show extremely well how little importance has been attached to unprejudiced observation in all times; how the interpretation of obscure symptoms has always been dependent upon the most recent modes of thought, such as they were, at the particular period in the history of medicine; sometimes even upon chance but striking experiences of contemporary authors. The great anatomical period of the seventeenth century was marked by what may be called 'localizing views,' and a keen surgical spirit, which led, in diseases of the skull, practically to a variety of operations (trepanning, etc.), and theoretically to the belief that pain in the head meant disease in the head.

Nicolaus Tulpius⁽¹⁵²⁾ had observed how an extremely severe headache had disappeared after a discharge of pus from the nose, and he did not hesitate to generalize from this observation, and to advise that 'in such cases' one should help Nature with sternutatories.

Relying upon Bartholini's observation of headache caused by 'stones' (probably osteomata) in the frontal sinus, and bearing in mind the possible presence of worms in these cavities, the French Academy of Surgery⁽¹⁵³⁾ recommended trephining when local disease 'or various other circumstances demand it.'

In the same way we find the trepan recommended in fixed headache on the strength of a few fortunate cures. This idea we have seen revived in the most recent times.

It did not occur to any of the old surgeons to console themselves with a theory of such fixed pain; it was reserved for more modern times to discover the 'nervous headache.' Till within the last few years it has rather been the habit of medical opinion to attribute to some organ or part of the body an ailment, the cause of which was sought in every other part of the body but the one most concerned. The observations which referred localized pain to localized disease have been lost sight of—almost intentionally, one might say. Certainly one cannot commend the blind empiricism of some of the older

surgeons, but their impartial observation and absence of prejudice are worthy of all imitation. It is a paradox. At one period it was impossible to recognise exactly the deeper-seated diseases of the head, but their importance was duly appreciated. Of late years, since it has become possible by improved methods of examination to diagnose with some accuracy the nature of intracranial processes, it has become difficult to make some persons realize their significance, although their effects are very evident and easy of apprehension as compared with a purely theoretical explanation.

Certainly it is not to be wondered at that, in the eyes of most surgeons, rhinology should have become discredited from a theoretical, and still more from a practical, point of view, since the practical success of Hack and his fortunate contemporaries swelled the tiny rivulet to a great flood, which, quickly passing, left behind it only the dregs of general mistrust and specialistic trifling. In the face of this, it is no easy task to obtain recognition for facts, to the proper estimation of which right treatment is most essential. The power of recognising deep-seated disease in the nasal cavities will have to become much more general than it is, even amongst specialists, before we shall be able to show our colleagues any large number of convincing successes.

Headache cannot always be distinguished from so-called trigeminal neuralgia. It has become usual to limit the term 'headache,' to pains which are felt above the line where the hair begins on the forehead, whilst pains about the face below the line are called neuralgia. This is not a good distinction. Tenderness to pressure of the affected nerves is the only sign distinctive of neuralgia. If, however, we keep to the division mentioned, for the sake of semeiology, we shall find, contrary to what was formerly assumed, that most patients suffer from headache, not neuralgia. Frontal headache is by far the most frequent; occipital and vertical headache are less frequent, except in connection with tenderness to pressure of sensory nerves.

There is no fixed relation between the localization of the pain and the seat of disease, not even for all cases of the same kind. On the contrary, the pain is not generally felt at the

seat of disease ; it may even be constantly felt on the opposite side of the head from the disease. In empyema of the antrum frontal headache is most frequent ; in frontal empyema I have twice seen fixed occipital headache ; in sphenoidal empyema the eyes are often painful. On the other hand, the seat of pain is almost always constant in the same case ; it very rarely moves about. I have not often met with the neuralgic forms of pain. Twice I have seen typical superior dental neuralgia in acute empyema of the antrum, and once in a chronic case (amongst seventy - five cases). Once I observed the same symptom in ethmoidal empyema. Once I observed mastoid pain in consequence of ethmoidal caries ; and twice occipital neuralgia in sphenoidal empyema.

The localization of pain by the patient is thus a most uncertain aid in diagnosis ; but, on the other hand, pain on palpation is a sign of very considerable value in detecting the primary seat of disease. If one finds, while using the probe, that touching a particular spot causes pain of the same kind as that which occurs spontaneously, one may be almost quite certain that this spot is the chief seat of disease. Pain on palpation is also of course a guide in threatening rupture of empyema of the antrum or frontal sinus.

In the same way, if one finds, after suitable treatment, that a spot which was formerly very painful when touched with the probe is now no longer so, one may assume with probability that the part is no longer inflamed. Touching carious bone is, as a rule, extremely painful, but if the bone is only rough (being as yet insufficiently covered) and free from local inflammation, it may be touched without pain, and the result in a majority of such cases may safely be left to the *vis medicatrix naturæ*.

Periodicity in the pains generally alternates with an overflow of discharge from the diseased cavity, the pain being obviously due to retention of discharge. This, however, only holds good of short periods. The long intervals which sometimes interrupt the course of empyemata, so that they almost seem to be cured, are generally free from pain. It sometimes happens, too, that the pain intermits during an intercurrent cold in the head, when the secretion becomes

very copious. As a rule, pain is a very variable symptom. Many cases suffer constant pain with occasional exacerbations, whilst others only have an attack when they lapse into irregular living, and especially when they indulge in alcohol. Finally, we have the unmistakable paroxysm of hemicrania, with intervals either absolutely free, or with only slight dulness in the head, the pain sometimes flaring up at the menstrual periods. Upon the whole, one must emphasize the fact that the various types of headache which occur in consequence of nasal suppuration cannot be differentiated from those which occur in consequence of other nasal diseases, nor from the so-called nervous headaches of the type of migraine.

I have observed typical attacks of migraine (with vomiting and eye symptoms) in four cases ; three were cured, the fourth was not treated.

The intensity of the pain is subject to just as great fluctuations in different cases and at different times. Sometimes it is continuous and uniform, hardly varying at all. Some of my patients were not really conscious of it till after they were cured ; they had become so accustomed to the constant headache, lasting for years. Others were laid aside from work at times, as it aggravated the pain. Not a few suffered a perfect martyrdom from pain and broken sleep. One man was reduced to complete imbecility, so that for over six months he sat brooding, and was incapable of attending to his business as a publican. Finally he attempted suicide, and had to be constantly watched. (This case is described in detail under 'ethmoidal empyema.')

Killian⁽³⁹⁾ tells of a similar case, and I have several times seen *tædium vitæ*, and once attempted suicide. With regard to the frequency of headache, it is almost invariable in acute empyemata, and reaches the greatest intensity. In chronic suppuration it is also very frequent. I found it in 56 per cent. of my observations, and often it was this symptom alone which brought the patient to the doctor. Not very rarely patients resort to the rhinologist for the cure of headaches, patients who do not know that they have any nasal suppuration, and who often will not admit it when questioned.

A word of warning is necessary, however, against the error of assuming, when nasal suppuration and headache are both present, that the latter must necessarily be the result of the former. Such an assumption would be very likely to lead to a mistaken prognosis, and disappointment of the patient. Even prompt reaction and disappearance of pain after suitable treatment—that is to say, immediate freedom from headache after opening a suppurating cavity—must not be accepted as conclusive, for headaches from other causes are sometimes influenced for a time by intranasal operations. I generally suspend judgment as to the causal relation of the suppuration to the headache, till the pain has disappeared for a considerable time, under treatment of the suppuration. Temporary cessation and then return of pain is a suspicious sign, calling for caution in prognosis, especially if the pain recur after the empyema has improved, and while it is running a favourable course. In one such case the continued recurrence of pain alone (there were no other suspicious symptoms) led me to suspect the existence of a malignant tumour. The patient sought help elsewhere, and when I saw him eighteen months later the signs of tumour of the base were fully developed. Post-mortem I found a sarcoma of the body of the sphenoid⁽¹⁵⁴⁾. One must never forget that there are more causes capable of producing a certain symptom than the cause that happens to be most evident; and secondary changes on or inside the base of the skull may be so far advanced that the cure of the original disease may no longer suffice. From an experience, fortunately limited, in this direction, I have formed the opinion that a certain apathy, and a sleepy look on the part of the patients, are to be regarded as suspicious signs, though by no means amounting to proof. See also Begbie⁽¹⁵⁵⁾. However distressing the destruction of well-founded hopes may be, none the less regrettable on the other hand is the indolent or casual way in which the really serious sufferings of patients with headache are so frequently treated.

It is painful to see, time after time, how this most important symptom fails to arouse the attention of the physician (and also of the specialist), to the fact, that in addition to the easily recognised, and in themselves comparatively unimportant

polypi, some other condition may be present which ought to be found and removed, in order to relieve the patient of sufferings which are often very severe.

It is not sufficient, in operating on polypi, to notice that one frequently opens suppurating cavities in the middle turbinal; one must also appreciate the significance of these collections of pus sufficiently to cure them, otherwise the patient is but little benefited by the diagnosis (if indeed it is made).

Numerous patients who have consulted me for severe symptoms had been previously in the hands of specialists, often highly esteemed, without having any other treatment than the repeated removal of polypi; or even 'expectant' treatment. I say nothing about cases which had only been seen by general practitioners, whose experience in such matters is of course less. There is certainly no lack of examples of inefficient treatment through neglect of the causal indications.

Internal medicine has explained the causes of many kinds of headache, and it is now quite time that the expression 'nervous headache,' as an ætiological term, was discarded. Unquestionably the most obscure cases are caused by irritation—sometimes very slight, sometimes considerable—proceeding from the nose, teeth, eye or ear, and can only be cured by treatment directed to the cause. 'Under this heading I include,' says Strümpell⁽¹⁵⁶⁾, 'those cases in which the headache may be considered to a certain extent a disease by itself, or, at any rate, as the chief symptom of which the patients complain, and from which they seek relief.'

It is natural that a patient should consider his chief symptom as the disease, but a physician is bound to avoid this error, and his efforts to cure disease will only be successful in proportion as he acts up to the motto, 'Morborum causis indagandis.' To call a disease 'nervous' is often only a cloak for ignorance, and we have seen many a poor patient suffering under the moral stigma of malingering, or, at least, considered hysterical or fanciful. Alas! there are far more fanciful doctors than fanciful patients.

How is the headache of nasal suppuration produced? Where swollen or hypertrophied parts are in actual contact, the pain may be due to the pressure which they mutually exert

upon each other ; but such contact is often quite painless, so that this explanation does not apply to all cases.

Frequently I believe the pain arises directly in the inflamed mucous membrane, the nerve filaments being compressed between the mucosa and the rigid bony walls of the nasal cavity, and the irritation spreading to other nerve districts. This explanation might apply to cases of suppuration in wide, roomy nasal cavities where there are no points of contact.

Finally, one must not overlook the disturbance of circulation, both of blood and lymph, at the base of the skull. This cannot be explained entirely on mechanical grounds, for one sees cases of complete nasal obstruction without a trace of headache ; but there seems to be no objection to the theory of reflex irritation.

As an intracranial symptom, **dizziness** must still be mentioned ; it is nearly always observed as a result of pain. I have observed it in a great variety of affections, but most frequently in disease of the sphenoidal sinus. However, it occurs also from simple irritation of the erectile tissue, and is not at all characteristic of suppuration alone.

Nervous symptoms of a more general kind also occur in nasal suppuration, chiefly in consequence of pain, and the sleeplessness and unrest which it causes, but also, perhaps, due in part to the close proximity of the suppurative process to the interior of the skull. Thus, we find **mental alteration and depression of spirits**, which may even amount to melancholia.

There is, of course, every degree, from irritability and disinclination for work, to real stupor. Usually only the milder degrees are present, but there may be the most pronounced depression.

Diminished capacity for work is common to almost all cases. This is due to the feeling of dulness or heaviness in the head, and the difficulty of thinking. Indeed, this may be quite impossible from the pain. A colleague whom I treated for bilateral ethmoidal empyema aptly described his own sensations as follows : Pressure on the vertex, as if a hand lay there. He could not follow a train of thought or conduct a conversation, for he forgot directly questions he had asked, and immediately asked them again. A feeling as if he were

10 yards away from a person who stood close beside him. His own voice sounded distant ; he was sleepy and inattentive, so that things which he proposed to do and things which he had done became mixed in his consciousness. He was, as it were, half asleep, and all impressions from the outer world reached him through a dulling or weakening medium.

The influence of chronic suppuration on the brain (through disturbance of the lymph circulation at the base) finds expression in a **weakened resistance to the action of alcohol, tobacco, and psychical impressions**, in nearly all sufferers from such affections.

Many patients have told me, either spontaneously or in reply to questions, that quite small quantities of alcohol were sufficient to get them into difficulties, and muddle them.

This intolerance is also found in patients who do not suffer from headache ; of this I have seen several examples. I remember particularly two, a hotel-keeper and a doctor, who had complained little, if at all, of headache. Both were very intolerant of alcohol, and this disappeared after the suppuration was cured. The case of the hotel-keeper was very striking ; for over six months he had drunk almost nothing but water. Although, perhaps, not altogether a desirable result of the cure, it was yet remarkable, how, after the empyema was healed, he was able to indulge freely, without inconvenience, in that abuse of alcohol which may be considered almost the right of his calling.

The restoration of the patient's drinking capacity was not exactly the object for which I had striven, but the result was interesting as showing how severely the cerebral functions must have been affected by the disease.

The majority of patients in whom cerebral disturbance was present suffered from disease of the ethmoidal or sphenoidal cells ; such symptoms were rare in empyema of the antrum. This is not to be wondered at, considering the closer proximity of the former cavities to the base of the skull. Borel⁽¹⁵⁷⁾ long ago made similar observations in this direction. He mentions that concealed caries of the ethmoid and sphenoid not uncommonly causes weakness of memory and melancholia, in addition to disturbances of sight and mental alteration. His

observations, although resting only on two cases, seem to be justified.

I should like here to mention an observation which I have repeatedly made on young persons suffering from severe nasal empyema. In several cases the mental features were so much alike that they may be considered characteristic. The condition seems to be intermediate between cretinism and hebetude. The subjects were always half-grown lads or girls, who were brought by their parents with the complaint that they were extremely backward in mental development, and that it was impossible to bring them on like other children. When left to themselves, they spend their time in stupid inaction, doing nothing at all; they are irresponsive even to the simplest or crudest pleasures; they whine and cry on slight occasion, and tire out all efforts to rouse them — not so much through obstinacy, as through an insuperable apathy and sluggishness. They dislike society, are devoid of all self-reliance, and complain of the head. When brought to the doctor, their appearance strikes one as expressing at once fear and cringing submission; and they behave accordingly. At the least touch they begin to whine, protesting, if one only depresses the tongue with a spatula, that they cannot endure any more. Nevertheless, they make almost no resistance, and in this they differ from children, and are thus to some extent more easily examined; but, on the other hand, it is only with the greatest difficulty that they can be brought to cooperate with and help the examiner, as by making certain movements in obedience to him, etc. Fear paralyzes their already feeble intelligence, so that they do not apprehend what is said to them.

This condition also occurs in half-grown persons with marked tumour formation in the nose; but I have only observed the pronounced form in suppurative disease, and the tendency to whine and cry at a moment's notice is, I think, chiefly found in it.

Kuhnt (⁷⁷) describes a similar mental condition in a somewhat older person of thirty-two years. 'She sits staring into vacancy, is entirely passive and apathetic, and answers all questions in a whining, complaining tone of voice.' A frontal empyema

was the cause of this demeanour, which disappeared after the operation, and was replaced by a sprightly gaiety.

Disturbed nasal respiration and impeded circulation at the base of the brain have long been known to exert an important influence upon cerebral function during the period of growth, as witness the condition of *aproxia nasalis*, first described by Guye as frequently present in adenoid vegetations.

In addition to these factors, however, the continual headache must, I think, be admitted as the chief cause of the mental and moral alterations described above as affecting the subjects of suppurative disease in youth. Going in constant fear of every shock or vibration, which they know from experience increases their pain, these poor patients shut themselves in from all external impressions, and their intelligence thus remains in a comparatively child-like condition of inexperience and ignorance. The continual state of fear destroys the character, for just at the time when the self-possessed conscious strength of the adult should develop from the helpless weakness and dependence of the child, it nips in the bud every impulse to employ the growing powers, so that they remain on a child-like footing. Their dislike of anything strange or unpleasant finds expression, not in resistance—the very idea of which would be foreign to them—but in helpless whining. Even after the cure of the causal disease, this condition of arrested development of mind and character only improves very gradually. If slow, however, progress is sure, so that after an interval of a few months, or longer, the patient often appears to be quite a different person.

Very many patients with chronic empyema who have endured for years the sufferings caused by their disease, and still more those entailed by the treatment to which they have been subjected, become neurasthenic; and persons originally courageous degenerate into mere nerveless cowards. This is not surprising, and may be seen every day.

Amongst general disturbances must be mentioned a condition of languor and weariness, in which the patient never feels well. Extensive ulceration and persistent suppuration are sufficient to explain this, but the poisonous action of reabsorbed pus must not be forgotten, and especially the disturbance of the

digestive functions caused by the swallowing of pus, often decomposing and fœtid. Many patients in whom the suppuration has been profuse and prolonged get to have quite the aspect of chronic stomach cases. Vomiting is an occasional symptom. I have never seen cerebral vomiting except as part of an attack of hemicrania, but I have observed vomiting from stomach disturbance, due to the swallowing of pus, or especially from retching caused by the presence of dry adherent crusts in the throat.

Nervous symptoms referred to distant parts, as recently described by Fliess⁽¹⁵⁸⁾, occur now and then in empyema, and disappear with the cure of the disease. Palpitation, backache, cold feet, pain in the shoulders, dyspepsia, are all occasionally observed, but cannot be discussed in detail here.

I have seen several cases of asthma in which there was nasal suppuration; and the presence of discharge which had found its way into the throat and dried there into crusts had an unmistakable influence upon the neurosis. Nasal suppuration may thus, under certain circumstances, be regarded as an accessory cause of asthma. As I believe, however, that the most various processes, central and peripheral, are at the bottom of asthma, I cannot accept the responsibility for any generalizations that may be deduced from these observations. In the present advanced state of diagnosis a great majority of the cases of nasal suppuration that come to our knowledge are limited to the interior of the nose; but not very long ago it was only when the process involved neighbouring parts that it was diagnosed.

VII. Extension to Neighbouring Parts.

Abscesses of the face are relatively the most frequent, and these may be :

- (a) Infra-orbital.
- (b) Orbital.
- (c) Supra-orbital, or frontal.

Under **infra-orbital abscesses**, in the narrower sense, we include only those which form after the pus has broken through the infra-orbital part of the upper jaw, and not those which

originate from the orbit by extension through the soft tissues, however marked the swelling and suppuration of the infra-orbital soft parts may be. Thus, a true infra-orbital abscess can only arise from an empyema of the antrum. Formerly, no doubt, they occurred more frequently, inasmuch as empyema of the antrum used only to be recognised from external signs (swelling, redness, pain, and bulging of anterior wall), and was allowed to become 'ripe' before it was actively treated. Nowadays such cases are rare. I have only seen three, two described on pp. 132, 142, and one in the case of a lady, who could not make up her mind to submit to timely treatment. The right side of the face was swollen in consequence of suppuration round a tooth, to which the dentist referred the whole thing. Although I warned the lady of the danger of delay, she would not have her nose examined.

By chance I saw her again, but the pus had already perforated the bone. She was obliged to submit to an extremely disfiguring incision through the cheek, which, after remaining open for a considerable time, left a deeply depressed cicatrix.

Ziem (¹⁵⁹) observed a case of empyema of the antrum with inflammatory swelling of the parotid region, arising probably by lymphatic infection in the same way. The formation of a false passage may give rise to this form of inflammation. One of my patients passed the little cannula, intended for washing out the antrum, up outside the bone, between it and the gum, causing an abscess, which did not heal for ten days after it was opened.

I have observed bulging forward of the anterior wall of the antrum in one other case, due to temporary closure of the ostium maxillare in the absence of accessory openings. The case will be found under the special pathology of the antrum.

Orbital abscesses are treated of farther on.

Frontal abscesses arise only in frontal empyema. They facilitate the diagnosis of diseases otherwise very difficult of detection. The signs of frontal abscess are obvious.

A very rare position for rupture is the hard palate, giving rise to an abscess in the mouth. In the following case, which came under my own observation, there was a combination of facial abscess with abscess of the mouth.

CASE 103.

Empyema of the Ethmoid Labyrinth and the Antrum, with Extensive Caries and Necrosis of the Bones of the Face. Catarrh of the Sphenoidal Sinus.

S. T., male, 68, had suffered for over six months from a discharge of pus from the right nostril, with obstruction. Several polypi were removed by his family doctor. On May 1, 1890, he was admitted as a patient to Professor Schéck's department. Some remains of polypi were seen on the right middle turbinal, covered with a thin layer of pus. These were destroyed with the snare and electrolysis. There was some suspicion of the existence of an empyema even at this time, but the patient remained away from the clinique for some weeks, and then returned with a recurrence of the polypi. These were removed, but the patient again absented himself, so that the proposed exploratory puncture of the antrum could not be carried out. The antrum was the cavity suspected, because pain was complained of chiefly in the region of the canine fossa. (Palpation of the right side of the face yielded a negative result). On account of the pain, the patient painted himself with iodine in the right zygomatic region, and appeared shortly afterwards with marked redness and swelling in this region, which was attributed to the iodine, till a few days later fluctuation appeared just below the right orbit. The eyeball was not prominent, but the conjunctiva was deeply injected. The middle turbinal was slightly coated with pus high up on the outer side, as well as at the anterior end on the part from which the polypi had been removed. The diagnosis of abscess in the right ethmoidal labyrinth, possibly penetrating to the lamina papyracea, was made. The involvement of the antrum was considered improbable on account of the high position of the abscess, and because, in spite of the swelling, palpation gave a negative result.

The day after this was made out (June 7) I proceeded to open the abscess under an anæsthetic. The antrum had already been punctured, but no pus found. A curved incision was made from the inner angle of the orbit downwards to a point below the malar bone, evacuating at once a large quantity of moderately fœtid, cheesy pus. The outer part of the lower edge of the orbit was completely absent. The anterior half of the malar bone and the malar process of the superior maxilla were intact; the upper and posterior surface of the former was quite destroyed, and also the lower orbital plate, so that the eyeball was completely exposed below, and could be lifted

upwards and forwards with the finger. After removing with the chisel the remains of the malar bone, one obtained access to a wide cavity full of cheesy masses and granulation tissue—the maxillary antrum—and through this, backwards, upwards, and inwards into a wider cavity, representing the ethmoid labyrinth. This also was full of cheesy masses. Several sequestra were next removed. It then became evident that the lower wall of the antrum, composed of the palatine and alveolar processes of the upper jaw, was also completely absent, the opening being covered only by mucous membrane, whilst upwards the cavity reached to the lamina cribrosa. In the abscess cavity the external pterygoid and zygomatic muscles lay free. The cavities were packed with iodoform gauze. During the next two days much watery fluid was discharged from the right nostril. This discharge ceased with the gradual onset of unconsciousness, restlessness, and paralysis of the right side of the face and right arm. There was paralysis of the sphincters and singultus; pulse of normal frequency and strength, no fever, heart normal. This condition continued with slight changes, such as the reappearance and cessation of the discharge and the disappearance of the singultus, to August 14, when death took place.

The explanation of the symptoms was uncertain; they were not quite in accordance with either apoplexy, embolism, abscess, or meningitis. It was thought probable that there might be an abscess on the convexity of the left hemisphere, caused by extension of the morbid process.

Post-mortem.—The dura mater was tense but not adherent; when opened, some watery fluid escaped. The pia was very opaque, and distended with serous exudation. In the posterior three-quarters of the left hemisphere the white substance was softened to the consistence of pap, with here and there patches of reddish-brown discoloration. The ganglia and other structural elements were no longer recognisable. This destruction extended anteriorly to a point under the left central groove. The vessels of the base were apparently normal; no thrombus could be found. The dura mater at the base was everywhere smooth; the bone was nowhere bare or rough. On chiselling away the roof of the right sphenoidal sinus, which was quite intact, the mucous membrane was found uninjured, but the cavity was distended with a mass of very tough mucus of a reddish-brown colour. The lamina cribrosa, on the other hand, was carious and friable, and through it one passed at once into the abscess cavity, in which there was no trace either of the ethmoidal cells or the lamina papyracea. In the uppermost part of the cavity there was only some tough blood-clot, but no pus or caseous masses.

There was much epicardial fat ; both ventricles, especially the left, were moderately atrophic and dilated, the muscular tissue brownish-red and very relaxed, the valves competent. The aorta was moderately dilated, the intima highly calcareous and ulcerated.

In the right kidney there was an old infarct. No signs anywhere of syphilis or tubercle.

According to the above report, one must assume as the cause of death a thrombosis of the left middle cerebral artery, quite unconnected with the disease of the bones of the skull, and due entirely to the extreme degree of atheromatous degeneration which was present.

This case, which had certainly lasted six months before suddenly threatening symptoms appeared, would very likely have led in a few days to meningitis, if the diseased parts had not at once been freely laid open. This issue in meningitis actually happened in an exactly similar case described by Scholz (⁹⁶).

In another case, that of a woman of 46, a hard, somewhat fluctuating swelling was observed to appear over the left palatal process—that is to say, under the suppurating antrum of the same side ; the swelling, however, subsided.

A single analogous observation is known in the literature. Snellen junior (¹⁶⁰) observed a fistula in the palate of a little girl of 4 ; this fistula led into the left antrum. The empyema had also ruptured upwards through the lower eyelid.

The eye and its surrounding parts are not often affected, but when they are the affection is worthy of all attention. Least harmful is the involvement of the oculo-nasal duct. Inflammation by extension of the purulent process is not unusual ; erosion of the bony walls of the duct is less frequent ; I have seen this on two occasions after the scraping out of carious bone. The fact was announced by the appearance of 'bloody tears' ; that is to say, for a few days one could see either blood-stained pus, or reddish, or pure bloody fluid oozing out at the inner canthus and trickling down the cheek. The symptom was most marked after blowing the nose, and soon disappeared.

The formation of a breach in the wall of the orbit by erosion

or injury of the lamina papyracea is not necessarily followed by serious results.

Without counting the above case, I have twice seen this occur in empyema of the antrum. Immediately after blowing the nose, emphysema developed in the connective tissue of the orbit, and especially under the conjunctiva, causing chemosis. This all disappeared in two or three days, the patient meanwhile refraining from blowing the nose. The eyeball was not displaced, and in this my cases differ from those of Berger and Tyrman⁽¹⁶¹⁾. Their cases were almost entirely due to injury, chiefly of the ethmoid labyrinth, and belong, therefore, to a different group. As far as I am aware, the origin of emphysema of the orbit from empyema of the antrum has not yet been recorded in literature.

Orbital abscess is much more frequent than emphysema, and it is produced by infection and inflammation of the cellular tissue of the orbit, either directly or through the medium of the lymphatics. Frontal and ethmoidal empyema are the most frequent causes. Welge⁽¹⁶⁶⁾, Scholz⁽⁹⁶⁾, Hartmann⁽¹⁶²⁾, Schäfer⁽⁶⁹⁾, Köhler⁽¹⁶³⁾, Zirm⁽¹⁶⁴⁾, Peltsohn⁽¹⁶⁵⁾, and Hicquet⁽¹⁶⁶⁾, have reported cases (see under Ethmoidal Empyema for details). But empyema of the antrum may also break through into the orbit, as Krieg⁽¹⁶⁷⁾, Hartmann⁽¹⁶⁸⁾, and Kuhnt⁽⁷⁷⁾ experienced; and, according to Snellen⁽¹⁵⁹⁾, even sphenoidal suppuration may find its way so far forward. The symptoms and treatment of orbital abscess need not be discussed here, but it is very important to bear in mind in every case the probability of its origin from empyema. It is, of course, self evident, that successful treatment of such cases must include not only the evacuation of the orbital abscess, but the removal of the intranasal cause.

In the superficial parts of the eye, **chronic irritation of the conjunctiva** is the most frequent condition. How much of this is due to direct infection through the tear-passages, and how much to the conveyance by the fingers of pus from the nose, it is hard to say. So also with **eczema of the edges of the eyelids**, a very obstinate affection, which in many cases might admit of a better prognosis if more careful search were made for nasal disease.

More serious is **phlyctenular keratitis**, which, according to Nieden⁽¹⁶⁹⁾, is almost always due to nasal infection. The influence of nasal suppuration is also felt in the deeper parts of the eye. The connection with **iritis** Kuhnt⁽⁷⁷⁾ thinks extremely doubtful, in spite of Ziem's⁽¹⁷⁰⁾ and Fromaget's⁽¹⁷¹⁾ observations; but even Kuhnt considers the possible nasal ætiology of **cataract** worthy of consideration. Ziem had already drawn attention to the frequent dependence of cataract on chronic empyema of the antrum. Kuhnt⁽¹⁷²⁾ observed a case of **hæmorrhagic retinitis** from the same cause.

Atrophy of the optic nerve has been more frequently observed. Wiedemann⁽¹²⁰⁾ reports such a case in combination with cataract. The patient, a woman, had already been fifteen months under the treatment of an ophthalmic surgeon, and for six months she had noticed swelling of the right upper eyelid, when the sudden development of orbital phlegmon betrayed the existence of a frontal empyema. The fact that the eye affection (atrophy) was first noticed in the surgical wards after the subsidence of swelling which followed the opening of the empyema does not justify Kuhnt in his assumption that the atrophy first appeared 'later, after the cure of the sinusitis.' On the strength of this erroneous assumption he throws doubt on the connection with empyema.

We cannot explain the **inflammatory atrophy** which followed nasal polypus operations in Schmidt-Rimpler's⁽¹⁷³⁾ cases; but, on the other hand, Fliess⁽¹⁷⁴⁾ has established the fact of retro-bulbar neuritis as a consequence of sphenoidal empyema; for after the cure of the empyema the function of the eye returned.

Two cases of **optic neuritis** we owe to Sulzer's⁽¹⁷⁵⁾ paper, but the ætiology is by no means clear, and the same remark applies to Snellen⁽¹⁵⁹⁾.

Glaucoma and **hyperæmia of the uveal tracts** have been specially noticed by Ziem.

Into the explanation of all these phenomena, particularly the differentiation of endobulbar from retrobulbar neuritis, I will not enter, lest I be crushed between the hard millstones of doctrinal discussions.

The majority of eye changes are still very imperfectly known

and very inadequately explained, and I have brought forward the preceding observations chiefly with the idea of directing the attention of observers to this most promising field. In conclusion, let me commend Ziem's able and suggestive works to the attention of all who are interested in the subject.

Inflammation extending from the neighbourhood of an empyema may affect the **spheno-palatine ganglion**, which lies in the spheno-maxillary fissure close against the anterior and lower wall of the sphenoidal sinus, and the posterior limit of the hindmost ethmoidal cell. Thus, caries of the walls of these cavities may easily affect the ganglion. On two occasions I have observed symptoms indicating affection of the ganglion in sphenoidal and ethmoidal empyema.

In one case, after the removal of diseased bone, and while the wound was healing, a woolly sensation was felt in the face, and on examination it was found that sensibility was diminished from the upper eyelid to the upper lip on the corresponding side. This change was permanent. In the other case, after exposing the anterior wall of the sphenoidal sinus, I found that by touching the outer and lower part of it I could cause sharp pain in the forehead, eye, and teeth of the same side.

The most important region adjoining the accessory sinuses is the base of the skull. Extension in this direction leads to **intracranial suppuration**, which is unquestionably more frequent than is generally known in this connection. On the other hand, a greatly exaggerated fear of the occurrence of this deadly complication in consequence of polypus operations (and plugging) still prevails in many directions.

It is very probable that intracranial complications (meningitis, etc.), when they do occur after nasal operations, are almost always due to the presence of latent nasal suppuration, to which no attention has been paid.

The literature of this subject is extremely deficient. Wagner⁽¹⁷⁶⁾ could only find record of two cases of meningitis, and to these he himself added a third of supposed sinus thrombosis. Considering the very great frequency of nasal operations, the number of fatalities is so small (even allowing for a natural reluctance to publish fatal cases) that it is evident special circumstances are required to bring them about.

In the next place, it is very remarkable that all the fatal cases occurred after operations on the middle turbinal. But the middle turbinal is part of the ethmoid bone, which, according to my experience, is very often the subject of latent disease. Further, in one of Quinlan's (177) cases, several operations had been previously performed in the nose with impunity; not till the middle turbinal was attacked was there disaster. (Wagner misapprehends Quinlan's description, and takes this one case as two separate cases.) Neither in this case nor in Voltolini's does a plug appear to have been used.

Finally, in Wagner's own case, the threatening symptoms, and especially a violent epistaxis, appeared on the third day, and partly, at least, before the use of the plug. However necessary the tampon might be for the immediate saving of life, it yet seems to have hastened the fatal issue.

Wagner refers the hæmorrhage to thrombosis of the longitudinal sinus. In the absence of an autopsy one cannot be sure. Another possibility would be a simple erosion of the posterior nasal artery, as in my case (p. 86), or, as in Scholz's (96) case, a pre-existing ulceration of the cavernous sinus.

In any case, however, I consider it certain that none of these things could have been caused by such a simple proceeding as drawing a furrow on the lower edge of the middle turbinal three days previously.

If, however, we suppose that there was latent suppuration in the ethmoid, everything is easily explained. For, before everything, pyogenic organisms are necessary to set up a purulent thrombosing inflammation. According to Wagner, such organisms are always present in the nose, and may be sucked up by the returning lymph-stream to the base of the skull. But this view is not satisfactory. If it were so, considering the frequent presence of pathogenic bacteria and their frequent opportunities to enter the lymph-stream (after operations and the cerebral hyperæmia which follows the plugging), the process of infection ought to be not only more frequent, but quite usual.

Wagner considers this cerebral hyperæmia and the aspiration of the nasal lymph which follows its subsidence as the means by which pyogenic organisms are sucked up to the base of the brain.

The explanation is inadequate, quite apart from the fact that the process as imagined by Wagner is extremely questionable.

For the occurrence of infection in the upper regions of the nose and in the interior of the skull, there must be some solution of continuity, some injury to the tissues such as usually complicates suppuration of the upper accessory cavities. That such injury may be caused by retention of secretion, as in plugging, cannot be denied, but the plugs would have to be left in for a most unusual time—at least several days continuously. And even then decomposition might not occur if the interior of the nose were otherwise healthy. When suppuration is present, on the other hand, decomposition occurs with great rapidity, so that plugging can only be used with extreme caution.

Thus, latent suppuration, exerting unnoticed its destructive action, has a special tendency to create that predisposition in virtue of which pyogenic organisms gain admission to the interior of the skull, most easily after slight injury. In Wagner's case this injury was the hyperæmia of the middle turbinal, produced by the cautery. The swelling which follows cauterization is capable of damming back discharge and forcing it upwards. But even under such circumstances access to the interior of the skull must be very easy before mischief follows.

For I have myself, times without number, performed much more important operations than simple cauterization, in cases of suppuration of this region, without a single disastrous result. The only fatal case which I have seen in consequence of nasal suppuration was due to pre-existing caries with loss of substance in the lamina cribrosa; whilst a case of basilar meningitis, which I only saw post-mortem, was caused by spontaneous perforation of a sphenoidal empyema into the middle cerebral fossa. Finally, my theory of latent empyema is strongly supported by Wagner's remark, that his patient had previously suffered much from anæmia, and from severe periodic headaches, often lasting one or two days. As regards the previous condition of the other patients, the authors give us no information.

These remarks are also generally applicable to Lange's (178)

case, in which death followed the burning through of a membrane which closed the choanæ. In this case there is no question of empyema; but, on the other hand, Lange's opinion that it was a case of sinus thrombosis is open to the gravest doubt. The symptoms consisted in unconsciousness and delirium, albuminuria and restlessness to the close, 'without any sign of localized brain disease.' There were neither convulsions nor vomiting; pulse strong; no hæmorrhage. Unfortunately, he does not say whether iodoform was used. It is plain, however, that these symptoms indicate something very different from sinus thrombosis. In this case, as in the others, the decisive anatomical proof which alone could settle the question is wanting.

Heryng's (179) case shows the caution necessary in dealing with the results of dissection in judging of such cases. Death occurred, after galvano-cauterization of a turbinal, from tuberculosis of the brain.

For the rest, we possess a series of observations which directly support my view of the connection of fatal cases with latent suppuration, and go far to prove that the operation, in such circumstances, can only be considered as having precipitated the outbreak. The sequence of events in these cases is strikingly alike. First, we have an ordinary case of no particular gravity; then an operation of some sort, such as one may do hundreds of times without inconvenience (perhaps only probing). Almost immediately on this interference grave symptoms appear, of threatening or accomplished intracranial mischief. These symptoms develop out of a pre-existent, but hitherto latent, condition, the existence of which is sometimes demonstrable, or at least extremely probable.

Such was the course of the following cases:

1. In Demarquay's (180) case, twenty-one months before death, a frontal empyema was found to be present, in consequence of an operation for the avulsion of polypi. Later erysipelas appeared. Finally, another polypus was pulled away, and the stump cauterized with nitrate of silver. Brain symptoms and death followed this proceeding. Post-mortem it was found, in addition to meningitis, that the body of the sphenoid was friable and soaked with pus; the sphenoidal sinus, the ethmoidal cells, and the antrum, were full of pus. Even if

one were to attribute the last-named lesions to rough use of the forceps and consequent infection (an opinion which I do not share), yet the history of erysipelas and frontal empyema points distinctly to a latent inflammatory process.

A similar case is that of Mayer, quoted by Maas⁽¹⁸¹⁾, which follows :

2. Recurring nasal polypi of ten years' standing, and one enormous retronasal polypus. Removal of the latter with the galvano-caustic snare. Death from coma twenty-two days later.

Post-mortem.—Dura mater discoloured at the base, and perforated in places. An abscess as big as a pigeon's egg in the anterior cerebral lobe. Loss of substance in the lamina cribrosa and body of the sphenoid ; adjacent parts of the great wing of the sphenoid and upper wall of the orbit full of tumour débris and pus.

3. Knapp's⁽¹⁰³⁾ case. Phlegmonous inflammation at the upper edge of the orbit. Incision, with evacuation of pus. Six days later, after the patient had been feeling quite well, brain symptoms appeared, followed in three days by death.

The post-mortem showed an abscess of the frontal lobe, and necrosis of the orbital plate of the frontal bone.

4. Schäfer's⁽⁶⁹⁾ case. The patient, a soldier of 25, complained some days before admission of headache and cold in the head. There was pain in the right eye, and a feeling of pressure in the region of the forehead and nose. The eyelids on the right side were swollen and reddened ; the right eye prominent. The swelling increased rapidly, and foetid pus was discharged from the right nostril. Soon fluctuation appeared at the upper edge of the orbit, and an incision 8 cm. long was made, evacuating a few cubic centimetres of curdy foetid pus. In spite of this the swelling of the lower lid increased and spread to the zygomatic region, where an abscess formed and broke spontaneously. This abscess communicated with the orbital abscess. Later three abscesses formed about the root of the nose, and were opened, exposing rough bone at a depth of 3 cm. Irrigation produced only temporary benefit, the lotion returning by the right nostril. Suddenly symptoms of meningitis appeared, and death occurred in a few days.

The post-mortem revealed suppurative leptomenigitis and an encapsuled abscess in the right frontal lobe. In the right anterior cerebral fossa over the orbit there was an ulcerative perforation of the dura, and in the subjacent bone a carious opening 2 cm. long by $\frac{1}{2}$ cm. broad. Under this a subperiosteal abscess extended into the centre of the ethmoid. In the lamina papyracea there was a carious opening 1 cm. in circumference. In addition there was empyema of both frontal

sinuses and both antra. In the ethmoidal cells on the right side there was an abscess as big as a walnut, from which, in the author's view, the whole process had developed.

No sign of syphilis or tubercle in the body.

Similar to both the preceding is :

5. Sillar's (182) case. A frontal empyema opened, and apparently doing well. Suddenly severe brain symptoms appeared. Trephining was performed, and an abscess found in the left frontal lobe. Death in twenty-four hours.

CASE 105.

6. Empyema of the Antrum. Caries of the Cribri-form Plate of the Ethmoid, with Rupture into the Cranial Cavity. Death.

Miss S., aged 26. Had suffered since childhood from purulent discharge from the nose. Fœtor noticed repeatedly, but especially during the last six weeks, and, in addition, severe faceache on the right side. Headache infrequent. The left nasal cavity appeared normal and free from secretion, but on the right side pus flowed copiously from the middle meatus, quickly reappearing when wiped away. From the lower border of the middle turbinal grew a pale red, friable mucous polypus as big as a small nut. After removing this a few smallish granulations were still visible in the middle meatus. The antrum was washed out through a cannula introduced by way of the hiatus semilunaris, pus and fragments of crumbling solid matter coming away. The first upper molar on the right side had been filled. (When subsequently extracted, the caries was found to be cured and the roots intact.)

On November 4, 1881, I opened the antrum, under an anæsthetic, just above the second molar, and plugged with iodoform gauze. The outer wall of the antrum was found to be carious at its upper and posterior part, and in this situation a rupture took place externally in the course of the next few days, in spite of the opening made by the operation.

Pronounced phlegmon of the cheek developed; six days later it had to be incised. Many fragments of gangrenous tissue escaped through the wound.

The course of the disease became very tedious. In spite of continued treatment of the antrum, the discharge of pus remained profuse and foetid, both from the wound in the cheek and from the nose.

Not till March, 1892, did the wound become superficial.

Nasal suppuration still continued, though greatly diminished, and fœtor had been absent since the beginning of February.

It was remarkable that for a considerable time the washing out of the antrum had brought away no pus. The further course was rapid. Headache came on, most intense over the right eye, and a fortnight later it was at last possible to make an examination with the probe (this had hitherto only been possible under an anæsthetic, on account of the extreme sensitiveness of the patient). A large opening was found in the most anterior part of the lamina cribrosa, and there was free communication between the nasal and cranial cavities. Out of this opening the pus flowed. A few days later the patient died comatose. Operation was considered hopeless under the circumstances.

As no post-mortem examination could be obtained, one can only suppose that the case was one of chronic encapsuled abscess at the base of the skull, but whether subdural or intracerebral it is impossible to say. That it had existed for a considerable time is evident from the continuance of purulent discharge after the antrum was dry.

7. Lennox Browne's (183) case. A left frontal empyema opened. The probe passed a long way backwards and to the right. In consequence no further examinations were made. The patient soon became unconscious, and continued so till death, two days later. The autopsy showed a subdural abscess; necrotic perforation of the posterior wall of the frontal sinus and of the lamina cribrosa.

This case reminds one very much of my own, described above.

8. Krecke's (122) case. A frontal empyema was chiselled into. The patient felt well. Six days later brain symptoms suddenly came on. Death in two days.

Post-mortem.—Abscess of frontal lobe, limited by a pyogenic membrane.

I have elsewhere (154) minutely described a recent case almost exactly similar to the above.

9. Frontal empyema on both sides. Necrotic areas on the posterior wall on both sides; right pachymeningitis. For eight days all well. Sudden onset of headache and convulsions. Immediate trephining and free evacuation of a cerebral abscess. Cure.

Finally a case of Flatau's (7).

10. In addition to the usual headache, some mental alteration had been observed in this case. A sphenoidal empyema was opened, brain symptoms appeared, and death occurred in two days. The autopsy showed loss of substance in the upper wall of the left sphenoidal sinus, and secondary meningitis.

These cases in their anatomical features remind one so much of other cases in which no operation had been performed, that it seems hardly fair at once to assume the operation as the cause of the fatal event. Yet it seems tolerably certain that in some of them the already inevitable issue was at least hastened or precipitated by the operation, or rather, by its consequences. For instance, deep-seated suppuration for which there is free drainage may not be immediately dangerous. But it may easily happen that, after some operation on the more superficial parts, the drainage of the deeper parts is so interfered with by blood-clots or plugging, as to give rise to immediate danger and hasten the course of the disease. Or, again, it may happen that adhesions, which are often extremely tender, become loosened, and so allow of more rapid extension. In any case, all of these conditions call for very prompt treatment, and, wherever possible, free exposure of the cranial cavity, by which in many cases it may still be possible (see above) to save life.

The following interesting case of Baasner's⁽⁷³⁾ shows that this may still be possible under very unfavourable circumstances, when the intracranial process has been limited, and prevented from extending by firm adhesions.

The patient, a man of 42, was struck on the head by a beam sixteen years previously, causing pain over the right eye, dizziness, and vomiting. The vomiting lasted some considerable time, and during one attack a small quantity of whitish fluid was discharged from the right nostril. For about two years the patient was unable to leave his bed, and when he did so the nasal secretion became more copious. After five or six years it gradually ceased, and at the same time exophthalmos developed and became more pronounced. Pressure on a bulging of the inner and upper wall of the orbit caused a large quantity of thick green and light yellow extremely fœtid pus to flow from the right nostril. The exophthalmos then disappeared till the abscess cavity had filled up again. Finally the eyeball was displaced forwards, outwards, and downwards about 2 cm.

Rhinoscopy showed hypertrophies of the right upper and middle turbinals. These were removed by Dr. Seifert. A probe introduced into the nostril touched rough bone at a depth of $7\frac{3}{4}$ cm. from the edge of the ala nasi. Dr. Rosenberger next operated as follows :

An incision $9\frac{1}{2}$ cm. long was made above and parallel to the eyebrows, and this was joined by a vertical incision $2\frac{1}{2}$ cm. long down the nose. The flap so defined was reflected. In the upper and inner wall of the orbit there was a round hole as big as a shilling, in which the dura was exposed, and through this opening 40 to 50 c.cm. of fœtid pus escaped. The cavity was drained through the nose, and healing was complete in three weeks.

Thus, there was an empyema of the orbital cells of the ethmoid bone, with loss of substance in the lamina papyracea and cribrosa, and a subdural abscess which had bulged into the orbit, forming an orbital abscess. That these cases are quite undistinguishable from those fatal cases which end spontaneously without any operation, is apparent from the following notes ; and I have also included operation cases in which cerebral symptoms certainly appeared before the operation.

Finally, it is an undoubted fact that the cranial cavity may be infected from the nose through an error on the part of the operator.

One most tragic case of this kind was told to me by Dr. Lermoyez. A well-known Parisian rhinologist was taken ill with acute nasal suppuration, and, in the belief that he had to do with a frontal empyema, he endeavoured himself to open this cavity from the nose with a sharp spoon. In four days he was dead of meningitis ; he had opened the cranial cavity.

If the literature of intracranial inflammations following spontaneous rupture of nasal empyemata is scanty, this is due more to defective observation than to lack of facts. Even to-day the nose remains in the position of a stepchild, both to the pathological anatomist and the clinician, and this, perhaps, all the more because its importance has been exaggerated by many so-called 'specialists.' As regards pathological anatomy, it must be remembered that the anatomical examination of the interior of the nose is a tedious and troublesome proceeding, and cannot be carried out without damaging certain internal

parts which are necessary in a 'subject' intended for anatomical study.

Slight changes in the dura, which precede the more serious lesions at the base of the skull, often escape superficial observation.

Since aural pathology has been carefully studied, certain points in the ætiology of cerebral abscess have been established, and it has been found that the majority of cases, especially in the temporal lobe and cerebellum, are of otitic origin. One no longer speaks of 'idiopathic' cerebral abscess.

It is still otherwise with meningitis. Isolated cases of meningitis of the convexity, which differ from epidemic cerebro-spinal meningitis, not in their clinical aspect, but only in their mode of occurrence, are designated, if the cause be not clear, as sporadic cerebro-spinal meningitis, and are slumped together ætiologically under this name. In the majority of these scattered cases of meningitis the route of invasion will be found to be from diseased neighbouring organs; for to assume that the irritants which excite inflammation find their way in through intact, or relatively intact, superficial organs or from the blood (as we do in accounting for obscure sporadic cases of the epidemic form) is at variance with all our experience of abscess or diffuse suppuration of internal organs.

In meningitis of the surface we must consider the pneumatic spaces of the skull as occupying the very first place in furthering the invasion of external irritants, and this both on account of their close proximity, and because they are frequently affected by infectious diseases. Other neighbouring organs must of course be kept in mind.

The subject is far from being exhausted. New ideas suggest themselves, as one thinks of the pneumonias which run their course with the symptoms of meningitis; of the meningeal symptoms of acute empyema of the tympanum, of the mastoid, of the sphenoidal sinus; and of Weichselbaum's⁽³⁾ results in establishing the presence of the *Diplococcus pneumoniae* in the diseased accessory cavities in many acute infections. But enough. To discuss the subject further would carry us too far into the domain of hypothesis, whereas it is observed facts that we stand in need of. Although the number of such facts at our

disposal is small, they are confirmatory of the relation we have assumed. Unfortunately, we possess only one series of dissections — Harke's — in which the nose was thoroughly examined, and in this series the clinical histories, so necessary to complete cases, are wanting.

Harke examined four cases of meningitis which were neither tubercular nor otitic; in one there was an empyema of the right antrum, upon which he remarks: 'Infection of the meninges from the nasal cavity? The empyema did not seem to be of older date than the meningitis.' Further, in a case of unilateral empyema of the antrum, the cause of death is given as 'cerebro-spinal disease and tuberculosis of the lungs.' This is too incomplete to justify any conclusion.

In another case there seems to have been secondary disease of the accessory cavities and the meninges, following croupous pneumonia.

On the other hand, in a case which is described as 'epidemic cerebro-spinal meningitis,' in which there was bilateral empyema of the antrum, it is impossible to conclude from the brief description which was the primary affection, and, more particularly, the reason for calling the meningitis 'epidemic.'

These results emphasize the necessity of requiring an examination of the accessory cavities in every obscure case of sinus thrombosis, meningitis, or cerebral abscess. I have already recorded one case in which, by chance, convincing proof was discovered of the peripheral origin of the disease.

1. Basilar Meningitis due to the Spontaneous Perforation of a Sphenoidal Empyema into the Middle Cerebral Fossa, found by chance on the post-mortem table. Since then chance has favoured me with another case, which on account of certain interesting features demands more detailed notice.

CASE 106.

Suppurative Encephalitis following Empyemata.

2. Dr. Fuchs invited me to be present at the examination of the body of a boy of 14, as he was supposed to have died of tubercular meningitis, the infection of which had proceeded from the nose. The only history obtainable was to the effect

that he had had a perforation of the septum for a considerable time, and that he had been seriously ill for about four weeks. Dr. Fuchs came across him about three weeks before death, and he was then quite unconscious, squinting, and jerking one of his arms here and there.

The body was greatly emaciated.

The lungs were free from adhesions and from tubercle, although there were suspicious places. The right lower lobe was enlarged, succulent, and full of blood; pus could be expressed from the bronchioles. Beneath the pleura of the left lower lobe there were a number of roundish, light yellow prominences about as big as a lentil-seed; they were most numerous on the diaphragmatic surface. The cut surface of the lobe was very vascular. The nodular infiltrations were softened in the centre, and pus exuded from them on pressure.

The kidneys showed passive congestion; the other organs were normal.

The vault of the cranium was not adherent, the dura was easily stripped off, the membranes were transparent, the meningeal vessels greatly congested.

Both lateral ventricles were enormously dilated and full of clear, amber-coloured liquid—about 300 c.cm. At the end of both posterior horns were greenish-yellow brawny masses, beneath which the brain substance was softened and crumbly to a depth of 2·3 cm. The dura mater at the base was everywhere apparently intact, nowhere adherent to the bone.

After chiselling away the roof of the sphenoidal sinus, a greenish-yellow gelatinous mass was exposed between the bone and the lining membrane on both sides. The lining membrane was intact; on cutting it through, greenish-yellow liquid pus found in both sinuses.

The ethmoid labyrinth was empty on both sides, as were also the frontal sinuses. The mucous membrane was pale. Both antra contained dirty yellowish-green pus.

Almost the whole of the cartilaginous septum was absent, and the edges of the perforation were smooth.

Without this last fact it would have been impossible to arrange the subcephalic and endocephalic processes in chronological order. The smooth edges of the perforation of the septum showed that it was of old standing, and therefore the suppuration was also of old standing, for it is the irritation of purulent discharge that causes the scratching or picking of the nose that leads to the perforation. Infection must have taken place from the sphenoidal sinus by way of the lymphatics and without disease of bone. The route was clearly indicated by

the exudation lying between the mucous membrane and the bone.

The following clinical observations on **meningitis** have also been recorded in the literature :

1. Schütz (184) : Large polypus projecting from the left nostril. Phlegmon of the left side of the face. Incision. Return of the swelling. Death in two and a half months.

Post-mortem.—Carious perforation of anterior wall of frontal sinus and of the cribriform plate; suppurative meningo-encephalitis of the left frontal lobe.

2. Paulsen (185) : Sudden severe headache and swelling round the left eye coming on without previous illness. Stupor, right-sided paralysis, death.

Post-mortem.—Large perforation of posterior wall of frontal sinus, purulent meningitis, compression of left hemisphere.

3. Huguenin (186) : Perforation of posterior wall of frontal sinus, old adhesions of connective tissue between brain and meninges, purulent leptomeningitis.

4. Warner (187) : Patient, a man of 33, had suffered from frequent severe headache since a fall in youth. Sudden cerebral symptoms, and death in a day and a half.

Post-mortem.—Acute meningitis over both hemispheres; much pus in the lateral ventricles, the lining of which was rough and uneven. The dura was thickened over the orbital plate of the frontal bone. The lamina cribrosa was covered with lymph. Both frontal sinuses full of muco-pus. The mucous membrane of the nose and ethmoidal cells was swollen and covered with very fœtid semi-liquid lymph. Bones intact.

5. Ewald (5) : Influenza, empyema of both antra and of ethmoid labyrinth, purulent meningitis.

6. Schwabach (188) : A case of diffuse purulent meningitis, due to empyema of all the accessory cavities, except the frontal sinuses.

7. Knapp (70) : Purulent meningitis of the base and convexity in a case of multiple empyemata, mentioned previously (see p. 30).

8. Hoppe (189) : Fœtid nasal suppuration with swellings of the right cheek. Exophthalmos. Facial erysipelas. Retention of secretion. Death on sixth day from the beginning of the erysipelas.

Post-mortem.—Suppurative leptomeningitis. Perforation of upper and lower walls of right frontal sinus; pus in frontal sinus and antrum of same side.

In the following cases **one of the venous sinuses** was attacked as well as the meninges :

1. Scholz⁽⁹⁶⁾: Infiltration of the soft parts under the left eye, and of the left cheek. Sudden death from enormous hæmorrhage from the nose and throat. Caries of the sphenoidal sinus with erosion of the sulcus and sinus cavernosus.

2. Carver⁽¹⁹⁰⁾: Phlegmon of the left orbit; delirium, death. Pus in the left frontal sinus, discoloration of the bone of the orbit, purulent meningitis, pus in the longitudinal sinus.

3. Zirm⁽¹⁶⁴⁾: Epileptic attack; six days later bilateral exophthalmos; the following day death.

Post-mortem.—Thrombo-phlebitis of the veins which accompany the supra-orbital nerve, and of both cavernous sinuses. Pus in the left frontal sinus, orbital abscess.

4. Pekostawski⁽⁹⁷⁾: Purulent meningitis; pus in the sphenoidal sinus (?); erosion of the upper part of the vomer; softening of the sella turcica; thrombosis of the longitudinal sinus.

Cerebral abscesses are reported by the following authors:

1. Richter⁽¹⁹¹⁾: Sudden enormous swelling of the left upper eyelid; four days later coma and right-sided paralysis; death in the following night.

Post-mortem.—Perforation of both walls of left frontal sinus; evacuation of pus from the cranial cavity. (Subdural or cerebral abscess.)

2. Celliez⁽¹⁹²⁾: Moxas applied to relieve severe pain gave rise to caries of the parietal bone. Paralysis and swelling of the right upper eyelid. Coma, convulsions, and profuse discharge of pus from the nose and mouth. Death after seven weeks.

Post-mortem.—Large loss of substance in the posterior wall of the frontal sinus.

3. Begbie⁽¹⁵⁵⁾: Discharge of pus from left nostril for several months, and then cessation of discharge. Pseudo-erysipelas of left half of face; stupor and sleepiness, epileptic attacks, death.

Post-mortem.—Large abscess of left frontal lobe, necrosis of lamina cribrosa, and caries of frontal bone.

4. Jacobasch⁽¹⁹³⁾: 'An ulcer' in the nose, pain over the right eyebrow; two months later dizziness and vomiting, and after five weeks death.

Post-mortem.—Numerous old adhesions between the right ethmoid and the meninges; two large cerebral abscesses. No nasal discharge.

5. Bosquet⁽¹⁰⁷⁾: After catching cold, severe headache, stupor, and swelling of the right side of the forehead came on. Fluctuation was felt deep in the orbit, and an incision evacuated

foetid pus. After fourteen days syncope occurred, also paralysis of the detrusor muscles, and contractures. In spite of free exposure of the dura, death took place next day.

Post-mortem.—Cheesy pus in the right frontal sinus, and an old abscess in the left frontal lobe.

6. Redtenbacher⁽¹⁹⁴⁾: A cold in the head, followed after a few days by swelling of the left upper eyelid, and in a month by epileptic attacks, paresis of right side, swelling over left parietal bone. The opening of the swelling over the eye was followed by severe headache and stupor. The symptoms increased, and death occurred two months later.

Post-mortem.—Carious perforation of left frontal bone and formation of a sequestrum, the sinus communicating with the cranial cavity. Three abscesses in left frontal lobe.

7. Schindler⁽¹⁹⁵⁾: Acute onset, 'cold in the head'; infiltration of left upper eyelid. Soon delirium and paralysis of sphincters, coma, contracture of left arm. Opening of left frontal sinus, and evacuation of some pus. Advance of brain symptoms, metastatic abscess of left shoulder. Some improvement occurred, but the disturbance of speech remained. Two weeks later suddenly somnolence, coma, death.

Post-mortem.—Perforation of upper wall of left frontal sinus communicating with a large abscess of the left frontal lobe.

8. Wiedemann⁽¹²⁰⁾: Admitted with icterus, stupor, and a fluctuating swelling on the left frontal eminence. Left frontal sinus opened; anterior wall broken down by suppuration; dura mater exposed, discoloured, and behind it a large subdural abscess. Purulent meningitis already present. Death next day.

One sees that the foregoing cases do not differ in any essential point from those in which brain symptoms only appeared after operation. The practical conclusion is easily drawn: Immediate exposure of the cranial cavity, and search for intracranial suppuration is imperative at the first appearance of symptoms which are certainly cerebral.

Deep phlegmon of the neck and throat has important relations with nasal suppuration.

Weichselbaum⁽¹⁹⁶⁾ records a case of this kind which he observed on the post-mortem table.

A coachman who had just recovered from a severe illness of four weeks' duration, came under observation suffering from boils, and a muco-purulent discharge from the right nostril, which had existed for four days. He had also nephritis.

Three days later an abscess formed in the left tonsil, and shortly afterwards he died of œdema of the glottis.

Post-mortem.—Copious tough purulent secretion was found in the right nasal cavity, the right antrum, and the right sphenoidal sinus.

Unfortunately, nothing was known about the nature of the previous illness ; no doubt it was some severe general disease.

Ziem (¹⁹⁷) observed a marked forward displacement of the right tonsil, from infiltration of the cellular tissue near the angle of the jaw. Empyema of the right antrum was made out, and had certainly been present for over six months. In a second similar case the connection was less certain, but still probable. My own observations are as follows :

CASE 107.

Mrs. E. M., aged 30, was taken ill eight days ago with shivering, headache, fever, and great prostration. At the same time the right nostril was obstructed and discharged pus. For the last two days there has been sore throat.

May 18, 1893: The right side of the throat is the seat of considerable diffuse redness and swelling ; masses of muco-pus are visible behind the velum. It is impossible to see the naso-pharynx, but on introducing the finger swelling is felt over the right pterygoid process.

In the right nostril, which is completely obstructed (the lower turbinal pressed against the septum), there is a large accumulation of pus in the lower meatus. Three days later an incision above the right tonsil evacuated a quantity of non-foetid pus.

In spite of this, pus continued to flow from the nose, the swelling in the throat did not disappear entirely, and on the fifth day after the incision the patient began to suffer from dyspnœa at night. There was marked œdema of the uvula and posterior pillar of the fauces on the right side, extending to the tongue, but not involving the glottis. Scarification and the injection of 2 per cent. carbolic solution produced improvement.

The threatening symptoms disappeared, but large masses of muco-pus continued to be expelled from the right nostril on blowing the nose, and this especially on rising in the morning ; there was also dizziness, and a feeling of pressure in the forehead on stooping.

At last, on the eighth day, it was possible to see into the

middle meatus; there was no pus there, but plenty of it on the floor of the nose; posterior rhinoscopy was impracticable.

After most carefully cleaning the nose, the right antrum was punctured and washed out. The water came away clear, but the feeling of pressure in the forehead disappeared immediately and permanently, and no more pus was blown out of the nose, but mucus, at first blood-stained, and afterwards pure mucus in masses.

The nasal obstruction and swelling in the throat also disappeared.

Two days later posterior rhinoscopy became practicable, but beyond some redness and swelling of the mucous membrane in the right choana there was nothing abnormal. Secretion gradually diminished, and in a week cure was complete.

CASE 108.

Miss M. G., aged 31, took ill three weeks ago with headache, feverishness, and nasal obstruction. A few days afterwards she complained of pain in the left side of the throat, and difficulty in swallowing. Eight days later there was a sudden gush of pus from the left nostril, with great relief to symptoms. Suppuration continued, however, from that time, and the headache and dysphagia returned.

July 3, 1893: Nasal intonation; soft parts behind the ramus of the left lower jaw slightly swollen. Marked redness and slight œdematous swelling of parts round the left tonsil. Much muco-pus on posterior wall of pharynx, in the fornix, and in both lower meatūs. An incision was at once made above the left tonsil, but only blood came. Two per cent. carbolic solution was injected into the tonsil, and a lotion ordered to be sniffed up the nose.

Next day there was great improvement, the swelling in the throat being reduced. With the post-nasal mirror it was now possible to see a large swelling in the fornix over the septum, and especially over the left choana and mouth of the Eustachian tube.

Two days later this swelling was somewhat flatter, and there was very little discharge of pus from the nose. On the other hand, odourless pus was oozing from the incision above the left tonsil. Head almost quite free. Four days later I removed the still enlarged pharyngeal tonsil with Gottstein's curette, thus giving further relief.

Three days afterwards severe headache set in, accompanied by slight sore throat, obstruction of the left nostril, and increased discharge of pus, especially on the left side.

In the left choana there was swelling in the region of the

superior meatus, the middle turbinal lying against the septum. This was also so in front. On probing between the middle turbinal and the septum the instrument did not enter the sphenoidal sinus, yet it afforded relief immediately.

From this time there were no head symptoms, but tough muco-pus continued to be discharged from the throat. This gradually ceased under the use of alkaline washes and change of air.

When I saw the patient six weeks later the nose was normal.

CASE 109.

In June, 1893, I saw my third case. The patient, a man of 32, had an acute deep phlegmon of the neck, with secondary œdema of the larynx, which necessitated tracheotomy, and the evacuation of pus lying under the deep cervical fascia, in front of the thyroid cartilage.

No source of pus was found except an old focal suppuration in the left middle meatus, which was considered all the more probable as a cause, inasmuch as the infiltration had occupied chiefly the left side of the neck and throat.

As regards the first two of the above cases, their course is similar, and indicates rather a primary disease of the nose, with secondary throat affection; in both nasal signs appeared first, and throat troubles only after some days. The exact kind of nasal suppuration cannot be determined. In the first case acute empyema of the antrum seems the most likely; in the second case it lies between acute suppuration in the superior meatus and sphenoidal empyema.

Shortly after these cases had occurred to me, Liebe (¹⁹⁸) recorded a case observed by him in January, 1893, in which the dependence of the throat disease on nasal suppuration is made all the clearer by the previous existence of chronic empyemata of the antra. A bulging appeared behind the right tonsil, and there was severe pain in the throat. On incision no pus was found, but the swelling disappeared in four days under daily washing out of the right antrum.

One point about these secondary phlegmons of the fauces is worthy of particular attention: they are specially prone to develop in the posterior pillar, or in the plica salpingopharyngea.

Chiari⁽¹⁹⁹⁾ and Klengel⁽²⁰⁰⁾ have expressed surprise that phlegmonous anginas should ever rupture in these situations. For my part, I consider that the mere fact of an angina 'pointing' there, ought to suggest the presence of nasal suppuration as the cause, for pus from the nose naturally gravitates to these points.

Pus in the antrum may pass along the posterior alveolar canals (which pierce the posterior wall of the antrum), and so reach the sphenomaxillary fissure. Thence the pterygomaxillary ligament may conduct it downwards and outwards to the inner edge of the horizontal ramus of the lower jaw—Chiari once observed a phlegmonous angina rupture in this situation; or, again, the pus may pass along the palatopharyngeus muscle. On the anterior surface of this muscle it reaches the back of the tonsil, producing a retrotonsillar phlegmon or abscess, as described in the above cases.

Sinking still deeper, it may infiltrate the plica pharyngoepiglottica (as in my first case), and even give rise to œdema of the aryteno-epiglottic folds. Pus from the sphenoidal sinus, the posterior ethmoidal cells, or the posterior part of the nasal passages, may find its way under the mucous membrane covering the edges of the choanæ, and reach the anterior surface of the pterygoid process.

From the posterior surface of the palatopharyngeus, pus may find its way along the lowest fibres of this muscle to the anterior surface of the thyroid cartilage, as had probably happened in my third case. If it should not get so far, it may cause œdema or abscess of the salpingopharyngeal fold, as in the case that excited the astonishment of Klengel.

Ziem surmises on anatomical grounds that empyema of the antrum may give rise to perichondritis of the larynx.

The facts just recorded lead us to the consideration of **septicæmic and pyæmic metastases** caused by nasal suppuration.

Laker's⁽²⁰¹⁾ observation showed that a retronasal phlegmon may run its course under the guise of a septic infection.

'Typhoid symptoms' were present, and in another case of Manchot's⁽²⁰²⁾ the diagnosis of typhoid fever was actually given, on the strength of an enlarged spleen and roseola on the

seventh day of the disease. In the beginning of the illness there was pain in the nape of the neck; death took place on the tenth day.

Post-mortem.—The bowel was found intact, but there was retropharyngeal phlegmon, and pus in the sphenoidal sinuses. Unfortunately, the report gives us no means of telling whether the sphenoidal empyemata were to be regarded as the primary disease—the starting-point of the process—or merely as simultaneously affected.

The theory in Laker's case, that the 'typhoid symptoms' were due to involvement of the sphenoidal sinuses, is strengthened by Manchot's observation.

A paper bearing on this subject, with the title 'Cryptogenetic Septico-pyæmia,' was published by Campbell from the *Tübingen Medical Poliklinik*, which has been so rich in these mysterious cases.

The patient was a girl of $7\frac{1}{2}$ years, who was taken ill gradually. There was pain on swallowing, and movements of the head caused pain.

The head was held inclined to the right. There was 'considerable' redness in the throat, and slight swelling of the soft palate. No exudation. The cervical glands were moderately swollen.

Five days later diarrhœa came on, and erysipelas of the skin of the nose appeared.

Soon the neck became rigid, and delirium, anuria, vomiting, and dilatation of the pupil were added to the symptoms. The erysipelas spread to the right ear, and finally to the back of the neck. The cervical and dorsal vertebræ were not tender on percussion.

Death took place on the twelfth day.

Post-mortem.—The brain and spinal cord were normal; the spleen was moderately enlarged, and showed hæmorrhages into its substance; both kidneys were in a state of parenchymatous inflammation, with pyæmic metastatic deposits. Hæmorrhages were present in both small and large intestine, and in the cæcum were two submucous abscesses rather larger than peas. As the cause of all these lesions there was a retropharyngeal abscess almost as big as a walnut, occupying the right lateral wall of the pharynx at the level of the second and third cervical vertebræ.

The left tonsil was normal, the right somewhat thickened and fatty.

Bacteriological examination showed the presence of the *Streptococcus pyogenes* in the blood of the kidney, in the pus of the abscess, and in the erysipelatous skin.

Campbell thinks that in this case 'the septic infection showed itself in such a peculiar way, that a doctor who first saw the case when the signs were fully developed might very easily have made a mistake in diagnosis.' For my part, as far as my experience goes in reading reports of cases of pyæmia or septico-pyæmia, I can only say that one could not easily meet with a case in which all the symptoms pointed so strongly in one direction.

If the naso-pharynx had been examined, and this seems to have been clearly enough indicated, instead of a crypto-genesis we should, to use a botanical expression, have had a phanero-genesis, even during the lifetime of the child.

It may be objected that this case can hardly be classed strictly as a retronasal phlegmon. I believe, however, that there is no clear line of demarcation between retronasal phlegmon and an acute streptococcus abscess under the mucosa such as formed in this case.

There was apparently a primary erysipelas of the soft palate and naso-pharynx, and from this extension took place through the nose to the face.

A patient of Montaz's⁽²⁰⁴⁾ died of anuria with septic symptoms in consequence of bilateral frontal empyema. In Harke's dissections there is a case designated as 'septico-pyæmia,' with the extraordinarily defective clinical description, 'The patient died with a high temperature.'

In the right sphenoidal sinus there was purulent exudation; the mucosa of the vault and posterior wall was infiltrated. 'At the autopsy no cause for the febrile disease was found' is the comment; it ought to be no *other* cause.

Staphylococci were cultivated from the pus. It is impossible to say which was the primary condition, the affection of the throat or that of the sphenoidal sinus.

Metastatic Abscesses.—The credit of insisting upon the importance of these is due to Ziem⁽²⁰⁵⁾.

He mentions a case of Bayer's in which this author

attributed a pseudo-erysipelas of the leg to metastasis from an empyema of the antrum; and also a case of Hack's, in which, after an operation for polypus, swelling of the left wrist-joint appeared, and was probably due to the same cause, *i.e.*, metastasis; and in these conclusions one can only agree with him.

In addition he reports two cases: one of empyema of the antrum and abscess of the left leg; a second of acute nasal suppuration of undetermined site, with abscesses of the lower eyelid and the forehead, also of the right foot, and afterwards of the back and left thigh. The causal relation of the nasal suppuration in both cases is fairly clear.

Chatellier⁽²⁰⁶⁾ records a case in which pericarditis was probably secondary to empyema—bilateral empyema of the sphenoidal sinuses and a similar affection of the left antrum.

In Schindler's⁽¹⁹⁵⁾ case an abscess of the shoulder was certainly metastatic from a frontal empyema. One of Harke's reports may be mentioned in this connection, though it is again devoid of the slightest indication of clinical chronology.

It was a case of chronic dental empyema of the right antrum. (The cavity contained a large quantity of grayish-black foetid semi-liquid pus; the mucous membrane was thickened, granular, smoke gray in colour, and studded with a few isolated polypi. Alveolar periostitis was present with rupture into the cavity.) Death occurred from ulcerative endocarditis, which may, without stretching a point, be regarded as metastatic.

That **furunculosis** should result from nasal as it does from other latent suppurations is not surprising. Jeanty⁽²⁸⁾ observed this in a case of empyema of the antrum, in which also there was the interesting phenomenon of œdema of the legs, due, no doubt, to the hydræmia which results from suppuration. Cases of **aspiration pneumonia** may be added under this head.

Mya⁽²⁰⁷⁾ observed a child of 4 years suffering from acute coryza, with secretion which was at first muco-serous, later bloody, and then fibrinous. Three days later broncho-pneumonia came on in the left lower lobe, nephritis developed, and death took place on the eighth day.

The autopsy showed a gangrenous patch in the lung as big as a cherry-stone. In this, as well as in the nasal secretion, the blood, and the kidneys, were found the *Staphylococcus aureus* and *albus*.

Finally Jeanty (²⁸) reports a case of most profuse suppuration in the antrum, complicated by symptoms which he was probably justified in referring to abscess of the lung.

D. METHODS OF EXAMINATION.

THE examination of a patient who complains of nasal suppuration, or in whom it is suspected, begins with the consideration of the general aspect, and especially of the face. Every abnormal appearance in expression, every inequality in innervation, in colouring, or in outline, is worthy of our attention, and may be quietly noted while the patient is telling us the history of his illness. This history we must complete by putting pertinent questions as to certain symptoms, which many patients think have nothing to do with the matter, and about which they say nothing, or even deny their existence, *e.g.*, headache, dizziness, disturbances of sight, and affections of the throat and neck.

Proceeding next to the examination proper, we inspect, without instruments, the entrance of the nostrils, and then, but not till then, introduce a speculum for the examination of the interior. Contenting ourselves with noting what we see and what we do not see, we proceed to posterior rhinoscopy. If this should be impracticable on account of pus, or crusts, or blood, concealing the field, we repeat this examination later, after the anterior rhinoscopy has been completed.

Returning to anterior rhinoscopy, we take note of the secretion, observing where it is present and in what quantity. Any that is presenting is carefully removed with forceps and wadding under the guidance of the eye, care being taken to avoid causing bleeding. If the secretion should be much crusted, and so firmly adherent to the walls that it cannot be removed without injury, it must be first softened; plugging for a few hours, or overnight, with wadding, or sniffing up vaseline,

answers this purpose. Should the secretion be liquid and copious, so that it continually wells out afresh after it has been wiped away, a superficial cleansing may be effected by washing out.

While this is being done the head should be inclined forward, and the stream of water (lukewarm and alkaline) should only be allowed to flow during phonation. The interior of the nose, being now open to inspection, must be carefully examined, and the parts which are not visible must be investigated by the use of the probe. **The probing should never be omitted in any case**; it is impossible to insist too strongly upon its importance. Even where from the appearance of parts one does not expect to feel anything, it is still indispensable. The recesses of the nasal cavity are so numerous and so variable that perfectly normal appearances may mask very considerable changes, deceiving the most experienced observer. The position of the several parts may be next investigated with the probe; parts which are in actual contact and covered by mucous membrane often appear as one continuous surface, and their differentiation can only be effected by mechanical separation with the probe. The origin of tumours can rarely be seen, but it can always be made out by the feeling of resistance in probing. The consistence of presenting parts is equally often of importance in diagnosis. Finally, the depth (from the anterior nares) at which the probe enters certain parts enables us to draw safe conclusions as to the origin of secretion, which is either visible at the point of introduction, or wells out as the probe is introduced.

In addition to all this, it is well known that the probe offers the only certain means of establishing the existence of bone changes. The precautions necessary in its use have already been discussed (p. 17). All the methods of examination hitherto mentioned are applied to the elucidation of those points, the variety and significance of which has already been discussed in the chapters on secretion, and on the results of pathological anatomy. By their means also a fairly correct judgment may be formed as to the localization of suppuration in the ethmoidal cells or the sphenoidal sinus, and, in addition, they suffice to justify or to remove suspicion of disease of the large cavities.

Not always, however; if the secretion be copious, or the

nose narrow, it is often impossible to make out whether the pus comes from above, from the side, from the front, or from the back. In such a case the next step is to dam the pus back by means of plugs of wadding, which may be left in for from half an hour to twelve hours, according to the amount of the secretion. In this way it is possible to shut off certain regions of the nose from one another. Wherever one finds pus afterwards, one may reasonably look for its source.

In the same way one may make out that the pus originates from two foci. Further, by damming back the pus into a cavity from which it generally flows away continuously, so that the cavity is always empty, it is possible for once to find the pus at its source. Thus, according to the effect which one desires to produce, the opening of a cavity may at one time be plugged, at another time left open, and only shut off from the openings of neighbouring cavities.

If disease of the antrum or frontal sinus be suspected, one may resort in the case of the former to exploratory puncture, with subsequent inflation; and in the case of the latter to direct blowing out or washing out of the pus. The *technique* of these examinations, and also of transillumination, will be specially treated of in the section on diagnosis.

A few general remarks in conclusion.

One examination is no examination; a negative result justifies absolutely no conclusion; a positive result, unless unusually clear, must be confirmed by subsequent examination.

Wherever possible, the second examination ought to be undertaken at a different time of the day from the first; as a rule, the morning is to be preferred, for at this time the largest accumulations of secretion will be met with.

Further, one ought not to rest satisfied with having found something—a focus of suppuration, some considerable secondary affection, or what not—but always keep in mind that, in addition to that which one has seen, there may be a very great deal which one has not seen.

Examination should not cease even after one has gone on to treatment; it is much better to let the treatment be provisional, with a view to further discoveries, or, rather, to consider it as the means of such discoveries. The question whether suppura-

tion is limited to the cavity where one has first discovered it, or implicates others also, can often only be definitely settled by curing the discharge from the first cavity, and so proceeding by way of exclusion. The longer one studies this class of diseases, the less occasion will one have to help a lame diagnosis with this crutch ; but even the most experienced will be obliged to use it occasionally, and it is therefore better to make a virtue of necessity in advance, and thereby spare both one's patients and one's self bitter disillusionments.

In conclusion, the question arises : When the methods described above fail, is it justifiable to undertake an operation solely for diagnostic purposes ?

The same answer, dependent upon the conscientious consideration and self-examination of the surgeon, must be given in this as in every other department of medicine. Yes, if all other means are exhausted, and if the nature of the disease justifies the severity of the operation.

If all other means are exhausted !

Let not the surgeon forget, as so frequently happens, that his diagnosis can often be considerably advanced by the richer experience and superior technique of the specialist, so that when the methods of the former fail, it does not follow that all others are superfluous. Let him also remember that a mute passive resistance to the impatience of a patient is often more serviceable than a yielding activity. On the other hand, let the frequently timorous specialist not forget that almost all operations nowadays can be rendered absolutely devoid of danger in practised hands, and that one drop of certainty is worth more than a barrellful of expectations, good or bad.

We must content ourselves with leaving the consideration and decision of these difficult matters to individual cases.

E. GENERAL THERAPEUTICS.

TREATMENT in the various diseases which give rise to nasal suppuration must be directed to the cure of the whole disease, to removal of the causes which are at the bottom of the appearances presented. Not content with simply removing symptoms, or veiling them from superficial observation, we need treatment directed to the cause, for only such a treatment is worthy of the name.

Certainly the nose is not insufficiently treated, but rather inefficiently treated.

On the other hand, if one reflects that there are cures enough without treatment, without other treatment, at least, than the organism initiates by its own reaction, one must include this latter force amongst therapeutic measures, and may frequently limit one's self to allowing such reactions free play. For the rest causal treatment should concern itself with the removal of the influences which produce and maintain the pathological condition. The first set of causes we described under ætiology; they are almost exclusively of an infectious nature—at least, as far as acute cases are concerned.

As long as we are not in a position to combat the toxins of the pus bacteria more generally than hitherto by the introduction of antitoxines, so long must we leave to the alexines, or protective substances of the body, the battle against those causes of disease. Experience shows that they frequently repel the invaders. When they cannot do so, it is generally due to the fact that conditions exist which are favourable to the continuance of the morbid process, especially conditions which favour the retention in the body of the disease products, and so add irritant to irritant.

Even in acute processes our interference is sometimes called for. For although the natural reaction of the organism helps us against the exciting causes of suppuration, it is generally powerless to combat the support which the causes of suppuration derive from mechanical obstacles to healing.

The only way to break through these obstacles (as so often happens in the spontaneous cure of abscesses by external rupture in other parts) is closed by strong bony walls; the growths which elsewhere push the pus forward and fill up losses of substance find scanty nutriment in the thin lining of the pneumatic spaces, and where they do occur they generally serve only to form new receptacles for discharge, projecting into the cavities and enclosing new interspaces. Again, the walls of abscesses, which in other parts of the body are distended and elastic, and collapse readily when the pus is evacuated, are in this part unyielding, and enclose a space which can never be obliterated by adhesion of its walls. Farther, the natural openings of the cavities are few and badly situated for drainage, and the mucous membrane surrounding them is liable to swelling, often very rapid, which removes the last possibility of discharge escaping.

This is the point where interference may be effectual even in acute suppuration. Frequently a lift is all that is necessary to put nature in the saddle again; a single passage of the probe into a cavity the exit from which has been blocked by swelling suffices sometimes both to remove the pent-up secretion and, by reduction of swelling round the opening, to prevent its re-accumulation.

In other cases frequent and repeated artificial evacuation of the cavities is necessary before the swelling of the mucosa will subside. This may be accomplished by direct washing out of the diseased sinuses, best with a neutral fluid, such as sterilized salt solution 0.6 per cent., and this manipulation, of course, can only be carried out by the surgeon where the less accessible spaces of the pneumatic system are concerned. For this purpose I have found the tubes figured on Plate II. particularly serviceable, for, being furnished with lateral openings, the stream of liquid escapes in all directions. When the seat of suppuration is more accessible—in the nasal passages, for instance—simple

irrigation of the interior of the nose will in many cases suffice to help Nature to a cure.

I have found sniffing up liquid from the palm of the hand extremely useful in these cases, and I am in the habit of using a powder composed of equal parts of soda, borax, and chlorate of soda, directing the patient to dissolve a teaspoonful in a tumblerful of warm water. To injections and douches I have a strong objection, shared by many colleagues in this department of work. Even if pus do not find its way into the middle ear—a fear by no means unfounded—it is at least possible that it may be driven into deeper regions of the nose. When liquid is sniffed up, it follows exactly the paths of the inspiratory air, and certainly does no harm.

A really important matter is diligent and rational blowing of the nose, for this removes secretion in the most natural way. When I use the word 'rational,' I am thinking of the common experience, shared no doubt by every rhinologist, that very few persons indeed understand how to blow the nose in a rational way. The majority begin by closing both nostrils, and it is quite possible that secretion may be driven backwards into the tubes by the increased air-pressure which thus obtains in the nasal cavity. But even if it should not be driven backwards, at the very least it is insufficiently blown out, in spite of much exertion.

If one nostril be held closed, and the free nostril be blown through, an astonishing amount of secretion is often got rid of, which previously the greatest exertions failed to evacuate.

I consider that instruction in this trivial, but little understood art is extremely important in after-treatment. It enables us, almost always, to dispense with the doubtful process of washing out.

Many—indeed, the majority of—acute focal suppurations may be cured by this mild treatment.

If the evacuation of discharge cannot be accomplished in this way, treatment must follow the same lines as in chronic cases, in which it is generally no longer a question of treating original causes, but of removing the factors which keep the morbid process going. These factors are of two kinds: original mechanical obstacles to drainage, and changes secondarily produced.

The former must be treated on the ordinary surgical principle of furnishing facilities for continuous drainage.

Most suppurations discharge through the middle or upper meatus, and the enlarged middle turbinal often constitutes an obstacle; or even the normal middle turbinal if the nasal cavity be narrow.

Where it is clear that this is the case, the partial or complete removal of the obstructing part must be considered.

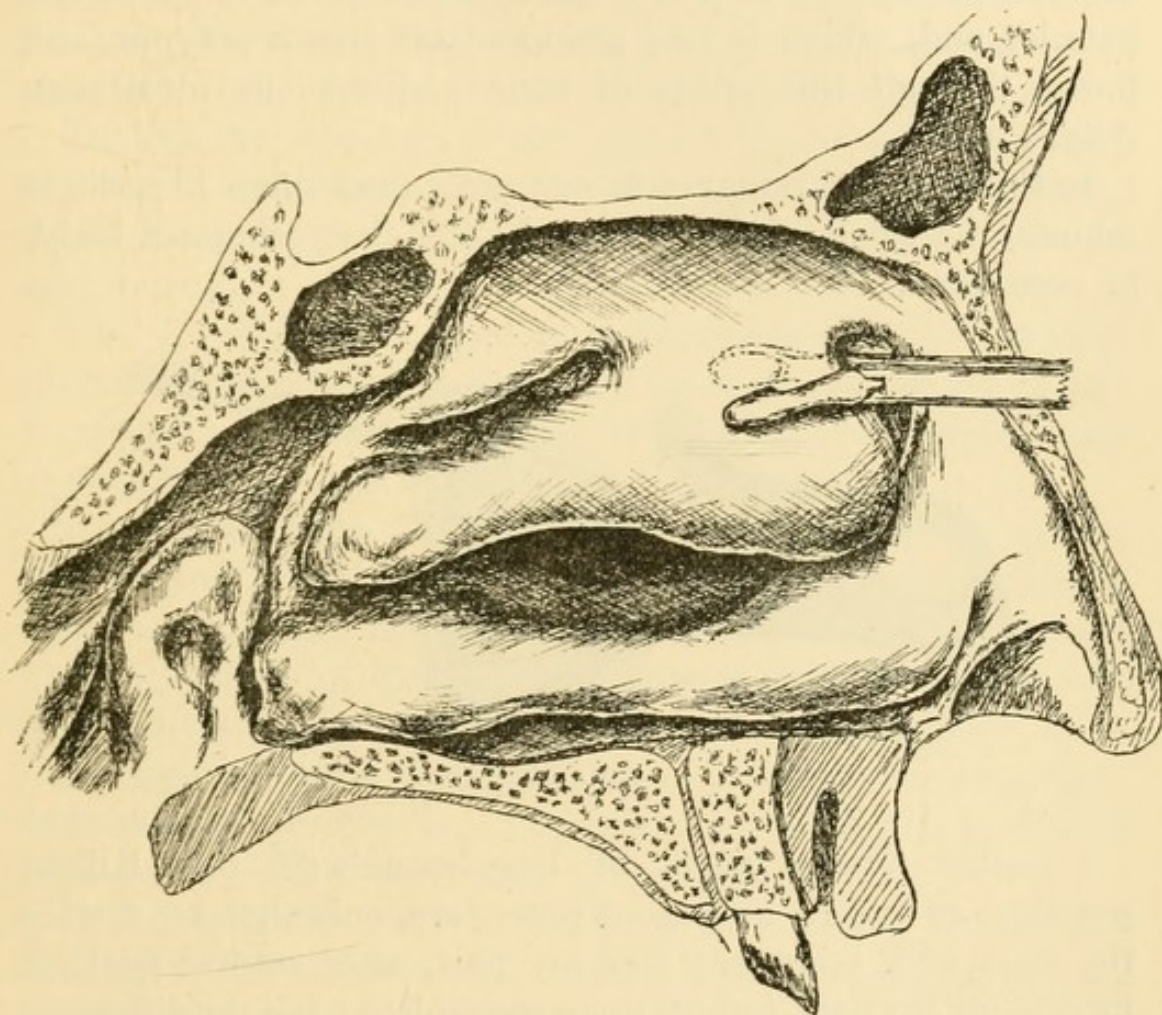


FIG. 1 A.

In order to accomplish this quickly and freely, and with as little shock as possible, I have employed for the last two years an operation which I have elsewhere⁽¹⁵⁴⁾ described. As I have found the procedure somewhat difficult of explanation in words, I have illustrated it by a drawing (Fig. 1).

The operator introduces the blades of a bone-forceps (I have hitherto used the one illustrated in Plate II., Fig. 1) horizontally along the base of the middle turbinal, so that

the one blade lies mesially and the other laterally to the bone. He then closes the instrument firmly, and at the same time rotates it strongly round its long axis (supinating the forearm), and thus detaches the whole of the anterior end of the turbinal from its base (Fig. 1 A). If the parts are obscured by blood, as may happen in a narrow nostril, he introduces a pledget of wadding soaked in peroxide of hydrogen, and waits ten to fifteen minutes. Where this is not necessary he proceeds at once to slip the loop of a galvano-caustic snare round the anterior end, which is now pedunculated like a polypus, and burns through the bridge of bone and mucous membrane (Fig. 1 B).

In this way one removes in one piece (and often in a single minute) the whole of the anterior half of the turbinated body, or even more.

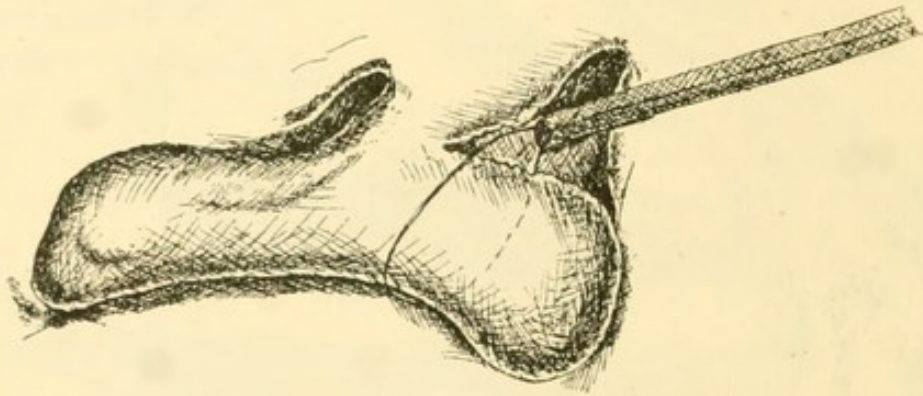


FIG. 1 B.

I gather from a paper of Engelmann's⁽⁵⁹⁾ that Killian practises an exactly analogous procedure, only that he divides the base with scissors. For my part, after several trials, I have found the bone-forceps more convenient; but the difference is quite unessential, and only proves that the operation is a good one.

After trying all sorts of other expedients, I can strongly recommend this radical method. Speaking generally, my experience of mild and hesitating proceedings has been such as to incline me very strongly to the more vigorous and far-reaching methods; if instrumental interference in the nose is really necessary, I can only utter a caution against timidity in operating.

Incomplete operations are almost dangerous ; they leave no room for reactionary swelling—unavoidable in the nose—the escape of pus is interfered with, and retention occurs. I remember a case of my own in early times, in which everything pointed to the conclusion that the reaction after a polypus operation (performed, as was then usual, without regard to the presence of suppuration) led to the extension of suppuration from the antra to the ethmoidal cells.

Besides, the radical operations are much less painful for the patient. Turbinectomy, by the method described above, under cocain, is very slightly painful—often, indeed, quite painless.

To free the openings of the cavities it is further necessary to remove swellings, hypertrophies, polypi, and adhesions ; these measures are, indeed, almost essential to the cure of empyemata.

The openings being freed, it is necessary that the purulent contents should have access to the deepest point of the cavity. How that is to be accomplished in each case will be discussed in the section on treatment.

Local conditions, however—especially in the case of the antrum and frontal sinus—may render this impracticable, and hence the proposal that we should aim at reducing the cavities to the condition of half-moulds, without which healing is said to be impossible, as secretion can always reaccumulate.

This view is quite erroneous, for I have myself been able to demonstrate the cure (*i.e.*, complete dryness) of frontal sinuses after a year, and of antra after several years.

Whoever believes that a cavity can be rendered incapable of healing by its shape alone, forgets that in applying general surgical principles to a particular region, one must take account of physiological laws applicable to that region. A part of the body which remains healthy under the most unfavourable surgical conditions conceivable, and which in acute disease so often heals spontaneously, requires in its consideration that special account be taken of this power. Just as surely as the great majority of cases of chronic suppuration of the accessory sinuses require an artificial evacuation of their secretion, so surely are they capable, with this help, of recovering their normal secretory functions.

I repeat emphatically that this has been established with the certainty of experiment.

No doubt it is indispensable to the continuous removal of secretion that one should remove also the secondary changes inside the cavities, changes which are calculated to keep up abnormal secretion, viz., growths and ulcerations of the soft parts and of the bones. For the removal of these conditions it is of course essential that they should first be diagnosed, which can only be accomplished by the **free opening** of the cavities. (See Plate II. for figures of instruments.)

For the thorough cleansing of such cavities as can be preserved, it is sufficient to wash them out with boiled alkaline solution through cannulæ which allow of free irrigation of all the walls. Thus, for the treatment of chronic suppurations we may lay down the following essential principles :

1. Exposure and freeing of the natural openings.
2. Removal of secondary changes which favour the continuance of the morbid process.
3. Restoration of the continuous, or almost continuous, escape of secretions.

The most appropriate means of applying these rules varies according to the seat of disease, and their consideration will therefore be reserved for the section on special treatment.

In every case of nasal suppuration it is indispensable to bear in mind continually the rules given above ; to go beyond them or to fall short of them is alike injurious.

Inseparable from the discussion of the means of cure is the question of the prognosis of the various processes, both with and without treatment.

F. PROGNOSIS.

IN the acute inflammations it is decidedly favourable, except for the fact that some of the cases will not heal without artificial aid. With such help they heal rapidly; without it they become chronic.

We are not very often in a position to see acute nasal suppuration, and in the majority of cases that do come before us we can only guess at their true nature. In particular, during the final purulent stages of an acute cold in the head, we are not always able to say with certainty whether the deeper-seated parts are involved. Our present experience, however, enables us to say that most cases of acute suppuration in which focal disease can be certainly recognised resist spontaneous cure.

This is by no means the same thing as saying that acute empyemata of the pneumatic spaces and localized suppurations of the nasal passages will not heal without treatment; on the contrary, it is based on the assumption that those cases of acute empyema in which the symptoms suffice for a positive diagnosis are unquestionably the more severe of their kind.

This opinion is abundantly supported by the facts of our experience.

But even these less favourable cases admit of a good prognosis, inasmuch as their treatment rarely requires to be of an operative kind, simple removal of secretion as described above generally sufficing for cure.

Acute empyema of the antrum is in my experience an exception to this general rule.

Although I must allow the possibility of spontaneous cure, yet I have been obliged to operate in the majority of such

cases. No doubt it is true also in this instance that it is the more severe cases which are diagnosed.

The only case of spontaneous cure of acute empyema of the antrum hitherto recorded is Davidsohn's⁽²⁰⁸⁾; and as the diagnosis only rested upon transillumination, it must be considered doubtful.

With regard to chronic cases, all the experience at present available justifies us in denying the possibility of spontaneous cure.

Siebenmann⁽²⁶⁹⁾ has put forward one solitary case: we shall see presently on what grounds.

In consequence of the extraction of a tooth, an empyema of the right antrum had arisen, and persisted for two years. The cavity communicated with the mouth, however, through the open alveolus by a broad short channel. In consequence of this, the patient was able easily to suck the secretion into the mouth, and at the end of the third year suppuration ceased and the opening closed. Thus the patient was cured by having Cowper's operation performed on him unintentionally at the same time that the cavity was infected; the after-treatment he himself conducted by frequent aspiration of the secretion. The fact that this continuous drainage was effected by the instinct of the patient rather than by the professional skill of the surgeon does not justify the description of the result as a spontaneous cure.

Thus, as far as we at present know, chronic empyemata of the antrum do not heal when left to themselves.* Whether other forms of chronic focal suppuration behave in the same way is not known; but practically one may disregard the possibility of spontaneous cure, and for my part I should never think of accusing anyone of the 'furor operativus' if, in dealing with an old empyema of ten to twenty years' duration, he preferred to operate at once rather than take the chance of its healing spontaneously during the next ten years.

As regards improvement, the case is different. Clinical histories show undoubtedly that it may occur, and that a fœtid

* A preparation of the Translator's demonstrates the possibility of spontaneous cure even in very chronic cases. It is described and figured in the *Journal of Pathology*, 1900.

secretion may become odourless, such change being mistaken for cure both by doctor and patient.

As examples of the former, I may quote Cases 14 and 20 of the 'ozæna' series on pp. 65 and 66; of the latter, I remember very well the pride with which the mother of a child suffering from severe nasal suppuration assured me that she herself in her youth had suffered from the same stinking 'catarrh,' 'but not for a long time now.'

A glance into the mother's nose showed me copious odourless crusts, which she 'was obliged to blow out; but they caused her no inconvenience.' This accounts for some of the cases of so-called 'spontaneous cures of ozæna in later life,' and the existence of others is at least doubtful, for I feel sure that there are many more cases of fœtid crust formation in elderly persons than is generally supposed. They do not come to the doctor, and in private life they conceal the only noticeable symptom, the odour, by stricter attention to cleanliness than is generally practised during the earlier periods of life.

When one considers that most authorities have hitherto pronounced 'ozæna' incurable, it is not surprising that the patients should renounce medical treatment, and so as they get older withdraw themselves more and more from observation, not because they are cured, but because they have abandoned hope.

If, on the other hand, real spontaneous cures of the chronic suppurations which cause these symptoms were more frequent, one would necessarily meet with many more cases of 'atrophic rhinitis without fœtor' (that undeniable clinical picture of a cured 'ozæna') than one does.

The dangers to life are slight both in acute and chronic suppuration; meningitis, etc., are comparatively rare as regards the very great majority of the processes, although the connection of meningitis with nasal suppuration has been proved to be tolerably frequent.

The danger to health, on the other hand, is very great in most of the chronic processes, as the cases I have described illustrating the after-effects show.

We have still to consider the prognosis of cases under treatment.

Simply to dismiss the question with the remark that all are curable—of which I am convinced by experience—would not throw any light on the practical points of view which must obtrude themselves on the attention of everyone who has much familiarity with the subject.

Ars longa, vita brevis—that is to say, the duration of treatment is often so long, the operations so severe and so painful, that the patient thinks he will never live to see the end of it, especially in combined empyemata.

There is, of course, the possibility of expediting the cure by opening all the sinuses from the outside by a radical operation under an anæsthetic, instead of proceeding step by step, as one must often do; but it is at least questionable whether this would be worth the risk, almost always present, of opening a number of healthy cavities unnecessarily.

In cases where grievous sufferings have tried the patient, and apparently hopeless work has taxed the patience of the doctor, I have always endeavoured to show inexhaustible patience, and often this endurance has been rewarded by a striking success.

Much more indifferent has been my attitude towards those affections which cause little or no suffering, and of which it may be said, after much experience, that they demand for their cure perhaps the very greatest expenditure in time and work, and in any case a considerable operation. I have considered that I have satisfied the requirements of such cases if by mild measures capable of application by the patients themselves I have further improved the condition, without completely curing it. One must not shoot sparrows with cannon, even when no smaller weapon will attain the object, and one ought not to advise a method of treatment that would cause the patient greater suffering than his disease, without improving his prospects.

PART II.—SPECIAL.

A. SUPPURATION AT THE ENTRANCE OF THE NOSTRILS.

SUPPURATION at the entrance of the nostrils most frequently depends upon inflammation of the structures connected with the hairs, either of the hair follicles themselves, or of the glands belonging to them—**folliculitis introitūs nasi**.

It is characterized by a tendency to continual recurrence. Usually a little rounded conical swelling, deeply injected, appears inside the point of the nose, or at the edge of the cutaneous septum, towards the very front of the floor of the nose. The patient complains of a feeling of great tension. In from one to three days the tension diminishes, and a little purulent crust appears at the top of the little swelling. When the crust is allowed to separate spontaneously the process is quickly at an end on that particular spot, but soon repeats itself, either in the same place or close at hand. Sometimes a feeling of intense itching is present, favoured by serous secretion from the neighbouring mucous membrane.

The course of events is different when this irritation leads to the crust being picked off. There is bleeding, a little blood-crust forms, which is again picked off, and, chiefly from this repeated irritation and the contact infection connected with it, in some few cases more extensive circumscribed areas of inflammation develop, such as a **furuncle**, or even a true **phlegmon**; and considerable quantities of pus may be evacuated. This is, however, comparatively a rare occurrence—I recall only four examples.

The first case was that of a youth who for two days had had a free discharge of pure pus from the left side of the nose, together with marked swelling and redness of the entrance to the nostril. On the floor of the nose anteriorly there was a very large furuncle which had burst, but was imperfectly evacuated. When freely opened it soon healed.

The second case was that of a gentleman of 40 odd, who, in addition to a typical folliculitis, showed marked erysipelatous redness extending from the point to the root of the nose. The skin was lax, and fluctuated over a considerable area. The inflammation had begun a fortnight previously with signs of great tension. A little pus had come away two days before I saw him from the point of the nose a little to the left, and at this spot the skin was very thin and covered with a slight crust. The case had been diagnosed as syphilitic by a specialist colleague, probably chiefly on account of a small perforation of the septum. An incision let out about a teaspoonful of 'laudable' pus; the skin, which had been raised by the suppuration, subsided again upon the cartilage, and in five days the case was cured.

The third case was that of a young man of 25, in whom an abscess formed in the tip of the nose, and healed after free incision in three days.

In the fourth case (a woman of 65), there was a similar abscess on the floor of the nose at the very entrance.

In connection with the entrance of the nose must be mentioned those abscesses of the most anterior part of the floor, of which Dreyfuss⁽²⁰⁹⁾ and Lacoarret⁽²¹⁰⁾ have described examples.

The first case was apparently similar to the first of mine described above, but in the absence of accurate description one cannot be sure; the second case was remarkable in this, that within three months an abscess formed three times in connection with a small cavity in the floor of the nose. Lacoarret surmises that the case was one of suppurating cyst. Possibly there may have been an inflammatory process in the prænasal fossa of Zuckerkandl.

B. SUPPURATION ON THE SEPTUM.

SUPPURATION on the septum is rare as compared with other nasal suppurations.

Phlegmonous processes occur in this region, generally caused by erysipelas. Wroblewski (²¹²) observed such cases in connection with typhoid fever. One is inclined to guess that they were referable to streptococcus infection.

More important and more frequent are **traumatic abscesses**. They resemble the primary infectious abscesses in their course, and in their tendency to produce necrosis of the cartilage. As regards their mode of origin, there is, of course, the possibility of direct injury, with simultaneous, or subsequent, submucous infection, but this is no doubt rare; the most frequent cause of isolated abscesses on the septum is external injury, a fall or blow on the bridge of the nose leading to the formation of a hæmatoma. Many such cases have been published of late years, after the example of Schäffer. Four cases of my own, occurring during the years 1890-94, led me to make the following observations. Three of the patients were children, as in Schäffer's cases, and one was a young man; the injury had taken place eight to fourteen days previously. In only one case was there a hæmatoma present at the time of examination; in the other three suppuration had already begun.

When I saw the first case with the typical semi-globular bulging on the septum (there was one on each side in this case), the likeness to hæmatoma auris struck me at once. The closer the comparison, the greater the likeness. Schäffer describes the following sequence of events. Epistaxis, swelling, redness and pain, or, rather, tenderness. These signs either subside or,

‘if the force was so great as to produce actual smashing of the tissues of the cartilage, and often also of the bony framework, the inflammation ends in suppuration, with consequent necrosis of tissue.’

The last remark does not quite correspond with the facts observed by me, for the comparison with hæmatoma auris extended also to the course.

In hæmatoma auris, as is well known, there is, in recent cases, a red or bluish-red, hot, undefined swelling, mostly at the edge of the helix. Left to itself, the colour pales gradually, after passing through the usual stages of blood-discoloration into biliverdin, etc., and there remains a marked deformity, due to necrosis of cartilage, often extensive.

If a child receive a sufficiently severe blow on the bridge of the nose, hæmorrhage takes place between the cartilage and the perichondrium on one or both sides. A subperichondral hæmatoma is formed just as in the case of the ear, and it is this localization of the hæmorrhage in both affections that determines the subsequent course. It is the separation of the perichondrium from the cartilage, and that alone, which leads to necrosis of the cartilage in the natural course of events. But necrosis of the septal cartilage, and ‘often also of the bony framework,’ is never produced by force alone; a fracture of those parts, as long as they are connected with periosteum and perichondrium, will heal like any fracture of the extremities. Neither is it the smashing that causes the suppuration; it is infection from without. In one of my cases I observed suppuration of the hæmatoma, the cartilage being still intact. Thus, just as in hæmatoma auris, so in the nasal septum: the separation of perichondrium from cartilage by effusion of blood leads to the death of the cartilage from insufficient nourishment. That a necrotic process offers a favourable ground for infection is self-evident. It is also intelligible, even without this condition, that infective particles may find their way from the nose into the effused blood (which lies immediately under the mucous membrane), and thrive well in the warmth and moisture.

Thus, a hæmatoma of the septum, untreated, must almost of necessity become an abscess of the septum, whether the cartilage was broken or not. However, this is not the reason

of the perforation, but the way is paved for perforation, even before suppuration begins, by the necrosis of the cartilage, and it is at most favoured by the greater and more prolonged separation of the perichondrium which results from the suppuration. Thus, both eventualities can only be avoided by early interference, just as in the case of hæmatoma auris.

A prompt cure without after-effects may be secured by a free incision, which on the one hand allows all secretion to escape, and on the other makes it possible for the perichondrium to be reapplied to the cartilage—best by plugging the nose. This was the result in one of my cases.

As a rule, however, the patients do not come till the stage of suppuration, and so long a time has generally elapsed that the cartilage has become necrotic, and loss of substance is unavoidable. It is good practice in such a case only to remove such necrotic fragments as are quite loose; any others should be left to themselves, so that more may be preserved. Should one encounter a traumatic fracture of cartilage in a perfectly recent hæmatoma, the greatest care and gentleness are necessary. No scraping, but only the most careful plugging. In this way many a piece of cartilage may regain its hold on the perichondrium, and the danger of a saddle-nose be averted. I have never found it necessary in my cases to remove a piece of mucous membrane with perichondrium; on the contrary, I consider, as I have just said, that the chief indication is the preservation of soft parts for reposition. A plug of iodoform gauze, introduced just far enough, has in my hands perfectly answered the double purpose of draining away secretion and preventing the premature closure of the wound. So much for traumatic abscess. For the rest, acute typical abscess of the septum is as yet unknown.

Suppuration on the septum in consequence of syphilitic changes will be considered later, in the special discussion on the relation of syphilis to nasal suppuration.

Chronic septal suppuration is only known to us in the form of slow traumatic ulceration. The subjoined name, *ulcus septum narium perforans*—perforating ulcer of the septum—is superfluous and fosters error, for it conjures up a picture of ordinary infectious ulceration, while, as a matter of fact, in

almost all the cases, repeated, or rather continual injury, in the form of scratching with the finger-nail, is at the bottom of the process.

Case No. 111, mentioned above, is specially interesting with regard to this question of ætiology, inasmuch as it supplies undoubted proof that the perforation was produced entirely in a mechanical way.

The gentleman in question had consulted me three years previously on account of a relapsing folliculitis (the septum being at that time intact), and ever since, according to his own confession, he had been in the habit of picking or scratching blood-crusts from the septum. Apart from his denial of infection (always to be taken *cum grano salis*), the cause of the perforation was clear enough. The hole was quite in front, within reach of the finger-nail; it was circular, as big as a pea, with smooth edges, and the septum round about was decidedly thinned.

A second case, in a man of 56, was exactly similar. I have observed several other cases of this kind of perforation, and the vicious circle was always the same: crust formation on the septum; picking off the crust, and so causing bleeding, which led to the formation of a larger and more firmly-adherent crust; and so on, the whole process being started by some inflammatory condition, such as suppuration in the vestibule or in the interior of the nose.

Six cases of this sort, originating from chronic suppuration in the accessory sinuses, showed very considerable perforations. The secretion adhered to the septum in front, where it exercised a certain continuous pressure; and partly from this cause, partly from the injury done by the finger-nail in picking the nose, the cartilage became necrosed.

This traumatic origin explains also the presence of pigment in the tissues round the edges of these ulcers. It is deposited from the frequent hæmorrhages, and it received from Zuckerkandl the entirely superfluous name of xanthosis.

Jurasz⁽¹⁴⁰⁾ declared that he could not convince himself of the possibility of traumatic perforation originating in the way described above; at the most, it might perhaps occur in cachectic conditions, and especially in syphilis; but this is certainly a mistaken view.

In the cases mentioned above only one patient had had syphilis, and the perforation originated under my own eyes, in spite of mercury and iodide of potassium, whilst the ulcer itself did not present a single syphilitic feature.

The others were not syphilitic, as far as this could be determined by examination during life, and in one case the absence of any sign of syphilis was determined by autopsy.

As regards other dyscrasias, it is true that some of my patients suffered from deterioration of the general health in consequence of chronic empyema, but in one case, that of a lady in blooming health, even this cause could be excluded. In her the perforation had been produced exclusively by the continued pressure of hard pus-crusts originating from the ethmoid, and it was situated so high up that the finger-nail could not have had anything to do with it.

Pressure erosion of this sort is, however, always a much less frequent cause than 'picking' or scratching the nose. The situation of the perforation indicates this; it is usually situated exactly at the spot reached by the finger-nail. The products of inflammation produce the irritation which leads to picking the nose, and in this way help the process.

The frequent occurrence of perforation in workers in chromium salts depends much more upon the scratching of the septum by the finger-nail than upon the caustic action of the chromate of potash; for the hole is always at the spot reached by the finger-nail.

Foulerton⁽²¹³⁾ recently described similar perforations in cement-workers, and gave the same explanation.

Betz's⁽²¹⁴⁾ observation, according to which particles of cement are deposited in the superior meatus, confirms this view; for otherwise the perforation would take place under the cement deposit, which is not the case.

It is worth mentioning that Potiquet⁽²¹⁵⁾ regards the most anterior part of the septum as specially prone to necrosing inflammations, on account of the presence of the little cul-de-sac of the organ of Jacobson, which may act as a receptacle for infecting organisms.

Chronic Abscess of the Septum.—Jurasz⁽¹⁰⁾ has recorded the only case, one of obscure nature.

C. SUPPURATION OF THE NASAL PASSAGES.

FORMERLY, from want of much experience, both personal and otherwise, I was obliged to treat this group of affections in a cursory and conjectural fashion, but now the subject rests upon a more solid base of observed facts. Under this head are included those cases of suppuration which originate in the nasal meatūs and have their seat there—not those collections of pus for which the nasal meatūs merely serve as a reservoir. The lower meatus has not yet attracted much attention in this direction. I have only observed one case of which I am sure.

CASE 114.

Catarrhal Inflammation of a Recess of the Left Lower Meatus.

F. A., 26, male, has suffered for about a year from nasal obstruction of a variable character, which came on after a severe cold in the head. When he blows his nose, thick yellow muco-purulent masses are expelled, chiefly from the left nostril, and before and during this process there is left-sided headache and 'irritation of the eyes.' Since the beginning of this illness he has been subject, about once a week, to an attack of flickering before the eyes lasting about five minutes.

There is marked deviation of the septum to the right; the anterior part of the left lower turbinal is much swollen, blocking the entrance. In the left lower meatus there is a quantity of tough yellow mucus. Between the swollen anterior end of the lower turbinal and the outer wall there is enclosed a tolerably large cavity, with a deep recess leading upwards and outwards. No bare bone can be felt in this recess, nor can any communication with the antrum be detected (that was, of course, one's first thought).

Removal of the anterior end of the turbinal with the galvano-caustic loop proved useless, for the opening of the recess was

still covered by the swelling. A typical amputation of the anterior half of the turbinated body, in the same way as described for the middle turbinal, exposed the recess sufficiently. The troublesome headache, etc., disappeared, and only a slight feeling of pressure on the forehead remained—no doubt in consequence of the pronounced deviation. The secretion became at once trifling; six months later a small crust of pus was still occasionally expelled.

Presumably the above case began as a simple cold in the head, which in the unusually deep recess developed into a suppurative process.

I have seen acute catarrhal inflammation lasting for two days, and then subsiding of itself, in a case of obstruction of the lower meatus from continued swelling of the lower turbinal after the filling of an upper molar tooth.

In the following case the symptoms were more severe.

CASE 115.

Acute Suppuration of the Lower Meatus with Conjunctivitis, the Result of Carious Teeth.

P. K., aged 19, female, complains that for the last three days, when she blows her nose, much matter and blood come from the left nostril. There is great swelling and redness of the conjunctiva of both left eyelids; the left upper jaw is painful and very tender on pressure. On the floor of the left nostril pretty far forward there is a clump of granulations, beneath and adjoining which the bone seems to be intact. The lower meatus is full of masses of muco-pus. The first left upper molar is carious. Exploratory puncture of the left antrum gave a negative result.

The carious tooth was removed, and in a couple of days all the symptoms disappeared, even secretion.

A case of abscess of the lower meatus reported by Mendel⁽²¹⁶⁾ was due to a diseased tooth, and empyema of the antrum was also suspected, as in my case.

These last observations ought to direct attention to the connection, through the medium of the lower meatus and lachrymal duct, between dentition and irritation of the conjunctiva; between chronic conjunctivitis and diseased teeth.

Catarrhal secretions from the lachrymal passages must, of course, in the absence of stenosis, find their way into the lower

meatus, and they may even form there considerable accumulations, which must be carefully distinguished from secretion of nasal origin. The question of the origin of secretion is particularly difficult to answer in those cases where one sees large accumulations of muco-pus in the lower meatūs of persons—both children and adults—who are the subjects of adenoid growths.

Are these accumulations entirely derived from the nasopharynx, or partly secreted where they lie?

Frequently the secretion disappears immediately on removal of the growths; but sometimes it continues, and of this I have seen several examples.

Now, swelling of the lower turbinal, though not, as Bressen (⁹²) says, always a consequence of enlargement of the pharyngeal tonsil, is yet very frequently so. As a rule, this turbinal swelling subsides of itself after removal of the 'adenoids'; but sometimes it persists, no doubt, in consequence of true hyperplastic tissue changes having already taken place. When this has been so, I have seen the masses of muco-pus continue to appear in the lower meatus, only to disappear when the hyperplasia was artificially removed.

It is, however, very possible, even probable, that these secretions originated, not from the throat, but from the lower meatūs, shut off as they were by the swelling of the lower turbinals.

Suppuration in the Middle and Upper Meatus

is much more frequent, and in many respects more important.

The acute forms generally appear under the guise of a cold in the head, of the protracted sort. Some time ago I expressed the opinion that the pus in these acute purulent catarrhs would be found to originate 'most frequently from the frontal sinus, and next from the middle meatus'; but the positive observations which have been accumulated in the meantime have changed this localization in favour of the last-mentioned region. In consequence of an acute cold in the head one sees frequently enough that secretion which was at first serous, then tough mucus, assumes on one or both sides a purely purulent character, and masses of pus are, after much exertion, got rid of by blowing the nose. This is particularly apt to be the case

after waking in the morning. In from two days to two to three weeks this secretion may cease spontaneously, or if not, it may pass immediately into a tedious chronic suppuration, of which more anon. This is not a very uncommon conclusion to a cold in the head, but the cases rarely come under observation, for only very nervous persons come to be examined for such a complaint. Nevertheless, I have several times had the opportunity of making such examinations. The suppuration was always of at least a week's duration, and there were hæmorrhages from the nose. The objective condition was more or less negative, but the evidence of observation from day to day pointed to the conclusion that the pus did not come from the general surface of the mucous membrane, but that certain circumscribed areas were exclusively, or at least chiefly, concerned in its production.

I learned most from the observation of my own case. After a severe cold in the head I have several times had a discharge of pus from the nose, lasting on one occasion three weeks. The discharge was always in the form of large masses or lumps of pus, which, after the nose was apparently quite free, would suddenly block one nostril (always the same nostril during the same attack), and could not be blown out without much trouble—only to re-form after an interval of half a day or a day. If the process lasted longer, blood became mixed with the secretion in consequence of the violent efforts necessary to expel it, in blowing the nose. Later the secretion was furnished more frequently, but in diminished quantity every time, till it finally disappeared, either quite suddenly, or, after a more protracted course, gradually. Once, during a prolonged attack, I had my nose examined; the mucous membrane was slightly hyperæmic, but the meatūs were perfectly free. A similar condition was present in the recent cases I had an opportunity of examining, and in particular I could never find an accumulation of secretion anywhere.

Since writing the above lines I have had a series of cases in which positive results could be obtained. The patients came complaining of intense headache, and one may assume, in conformity with the more marked objective signs, that the process was from the beginning of a more severe nature. In

all the cases, as the following descriptions will show, there was clear proof of the existence of focal suppuration (which in the earlier cases I could only surmise). The determination of the actual seat of disease was more difficult, and sometimes it was impossible to say whether it was in the meatūs or in the accessory cavities. Where this doubt existed, I have preferred to decide in accordance with what one could actually see, and have therefore described such cases as affections of the meatūs, although it was impossible to exclude the possibility that they were only acting as the channels of exit of deeper-seated foci.

Cases presenting themselves under the same clinical form, but in which acute empyema was certainly present, will be found farther on under their own proper heading.

The novelty of the subject demands a minute recital of the facts.

CASES 116 TO 121.

Acute Suppuration of the Middle Meatus.

1. A man of 33. In February, 1893, his nose was examined and found healthy. In April he suddenly began to have yellow discharge from the left nostril, such as he remembers to have had on one previous occasion. His head felt muddled. Pus could be seen to well out between the middle and lower turbinal. The anterior end of the middle turbinal was swollen. This swollen part was removed with the galvano-caustic snare; eight days later both head and nose were well.

2. A man of 40. Profuse discharge of pus for the last three weeks, especially from the left nostril. The nose was blocked, and there was great lassitude and very severe continuous headache. (The patient only complained of headache; the other points were elicited by questioning.) The illness began with feverishness and shivering.

Copious masses of pus, tolerably liquid, came from both nostrils, but especially the left. There was almost complete obstruction of the left nostril from swelling of the middle turbinal, and a highly sensitive spot was found external to the middle turbinal in the outer wall of the middle meatus. Probing gave immediate relief, and a strong inflation (Politzer's bag), directed towards the roof of the nose, farther relieved the headache.

Treatment.—Alkaline lotion to be sniffed up; castor-oil; ice-bag. Next day the headache was gone, and in a week the secretion had disappeared and the nose was normal.

3. A girl of 23. The nose had been previously examined

and found free from pus. Severe headache, especially on the left side, of three weeks' duration. Left middle turbinal swollen, reddened, in contact with the septum, and showing at that part traces of pus. Probing the middle meatus removed the headache instantly and permanently. When seen again the secretion had disappeared.

4. A man of 31. Nose found free from secretion at a previous examination. Had had severe headache for the last few days, especially on the left side. Pus from both nostrils, but most from the left. Pus on both middle turbinals; the left one was swollen and covered the middle meatus, out of which pus welled. Probing unsuccessful. Direct irrigation (through the sphenoidal cannula, Plate II.) gave temporary relief. This required to be repeated five times in the course of the next few days before all symptoms disappeared.

5. A man of 21. Left frontal headache for five days. Pus in the left middle meatus and upper part of the throat. Direct irrigation of the middle meatus at once removed the pain, and this treatment repeated once on the following day completed the cure.

6. A man of 34. For a few days had had severe left-sided headache and discharge of pus from the nose. There was pus in the left middle meatus, and slight swelling of the middle turbinal.

Direct irrigation on three occasions, and sniffing up an alkali in the intervals three times a day, removed the symptoms in eleven days.

Next comes a case of

Acute Watery Catarrh in the Middle Meatus.

A man of 22. For a fortnight had had pain over the right eyebrow and watery discharge from the nose. Probing the middle meatus, in which more clear glassy secretion could be seen, at once removed the pain, which during the next two days did not recur.

As a transition case I observed the following :

Suppuration in Right Upper and Left Middle Meatus.

A woman of 28 had had a discharge of pus from the nose for a few days, also severe pain in left upper jaw and right side of forehead. Pus oozed out between the right middle turbinal and the septum, and between the left middle turbinal and the outer wall. Probing negative. Sniffing up an alkaline lotion removed all the appearances in eight days.

Cases of Suppuration in the Upper Meatus

were rarer and more complicated.

1. A young lady of 31. Severe phlegmon of the naso-

pharynx, starting from the upper part of the throat, or from the nose. After subsidence of the most severe symptoms one saw, both from the front and from behind, that the left upper meatus was obliterated by swelling of the left middle turbinal, which lay in contact with the septum. There was severe headache. Probing gave immediate relief. Next day the headache was permanently gone, and the swelling less. Muco-pus continued to come from the throat, and did not cease till the patient went to the country. An alkaline lotion was ordered to be sniffed up.

2. A man of 39. Severe pain for eight days above and in the right eye. Ophthalmoscopic examination negative (Dr. Rhein). There was said to have been a profuse discharge of pus recently from the right nostril. Extreme deviation of the septum to the right; inspection of the interior hardly possible.

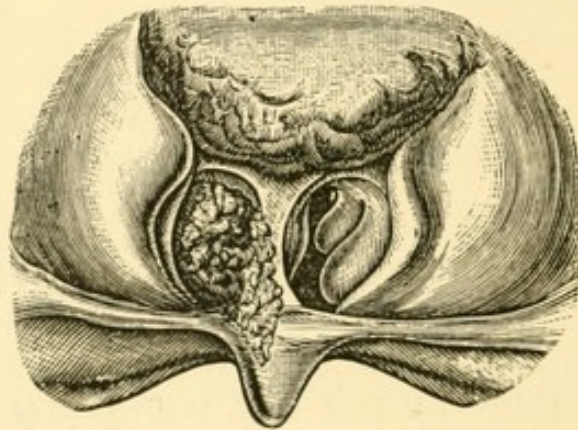


FIG. 2.

There was pus between the right middle turbinal and the septum. Fornix of the throat covered with pus; the upper meatus appeared from behind to be completely covered by the greatly swollen middle turbinal (Fig. 2). The introduction of a probe between the middle turbinal and the septum could only be accomplished with great difficulty, yet it instantly relieved the pain, though only temporarily. Direct irrigation was also tried, but the pain continued unabated for eight days. On the fourteenth day the swollen turbinal had subsided, the head felt almost quite well. After other eight days only a little white mucus came from the nose, and the pain was gone.

3. A man of 30 for some weeks had had pain at the root of the nose and discharge of pus. On the right side, pus was visible between the middle turbinal and the septum. The turbinal was uneven and looked spongy. The probe entered the sphenoidal sinus with immediate relief, but no control observations could be made, and the case remains obscure.

4. A spinster of 42 had had severe catarrh for several weeks, and very severe pain in the forehead and back of the head for the last two or three days. There was pus in the olfactory

fissure on both sides; the probe entered the left sphenoidal sinus. The probing had to be repeated several times, and after three days the pain yielded. Suppuration ceased in eight days, the patient meanwhile sniffing up an alkaline lotion.

5. A young lady of 26 had had severe pains in the right eye and upper jaw for the last eight days. The extraction of a carious molar gave no relief. She now came to me on account of the persistent purulent catarrh. There was a little pus on the right middle turbinal. The probe penetrated the sphenoidal sinus, upon which the pain at once disappeared permanently.

Remarks. — All the cases of acute suppuration I have examined have proved to be cases of focal suppuration; their most distinctive feature was their one-sidedness; to this there were three exceptions.

It is very remarkable that these unilateral suppurations, when affecting the middle meatus, always (in the six cases) appeared on the left side.

The clinical picture is so uniform that the descriptions given above need not be further discussed.

As a rule, one will only find the condition when one is on the look-out for it, for the patients generally complain of nothing but headache; to the suppuration they are, with few exceptions, as indifferent as—the majority of their doctors. The headache, with its sudden onset and persistence, in the absence of other striking symptoms, is almost pathognomonic of acute focal suppuration.

When I am called to a case of this kind, I always take with me my reflector and probe, and I have never yet done so in vain.

The diagnosis of a circumscribed collection of pus is easier to make than the localization of the process in the upper or middle meatus. Sometimes one sees on the septal border of the middle turbinal, pus which has found its way round from the external surface. If the first examination should not be conclusive, the second or third will be so.

The treatment is evident from what has already been said. The condition of the bowels requires attention, for constipation is generally present, as in most acute febrile states. The direct irrigation by means of cannulæ is only for purposes of cleanliness, so that sterilized salt solution answers the purpose; antiseptics are unnecessary.

Chronic Suppuration in the Middle and Upper Meatus.

Under this heading are to be included those processes which I formerly distinguished as 'circumscribed purulent catarrh,' and 'caries of the ethmoid bone.' At that time I was engaged in piecing together the previously unknown clinical picture of caries of the ethmoid (the explanation was still hidden), and I was obliged to limit myself to a sharp differentiation between the ulceration of bone at the openings of suppurating cavities, and empyema proper involving the ethmoidal cells; but now I am in a position to emphasize this distinction still more, and at the same time to establish with greater certainty the connection between the processes which attack the bone, and the circumscribed suppurations without bone disease, in the sense that these affections 'belong to the same category as ethmoidal caries, but are placed one step below it.'

In both cases one has to do with enclosed collections of pus in the nasal passages themselves, or in little recesses of those passages. The erosion of the bone is to be regarded as a purely secondary consequence, due either to the greater intensity of the process, or to conditions unfavourable to drainage.

In order to prevent misunderstanding—especially intentional misunderstanding—let me explain emphatically that I do not abandon any of my results; on the contrary, I am in a position to confirm them on anatomical grounds; only the description of the ulcers of bone which I found, as 'primary' caries, no longer appears justifiable. (I employed it at that time for purposes of differentiation in view of McBride's explanations.)

I am particularly happy to have thus definitely severed myself from Woakes's (⁷⁸) 'necrosing ethmoiditis,' a conception which does not appear to correspond to any process occurring in Nature, but rather to consist of the most various clinical pictures welded together.

The explanation of the origin of these ulcers of bone thus places them in series with the secondary erosions which follow other focal suppurations. Schech described them as caries at the openings of suppurating cavities, and I—a *potiori fiat denominatio*—can no longer use the name to designate a process in which they indeed occur, but which they do not cause. They

have lost nothing in clinical importance (as we shall see below), and the division of cases of circumscribed suppuration into those with, and those without bone disease, is justified.

If this explanation deprives the opponents of ethmoidal caries of one of their best points of attack—viz., its inexplicability—I tender them my apologies for not sooner furnishing the explanation, but, alas! things often occur to one rather late in the day.

At the time when I made my first observations on chronic circumscribed suppuration in the upper regions of the nose, nothing was known on the subject. Only Bresgen⁽¹⁴¹⁾ had emphasized the fact that ‘swelling of the mucous membrane in the middle meatus was often very considerable, and led to the retention of pus in this region.’ As Bresgen, like the rest of us at that time, considered the majority of nasal suppurations to be affections of the surface, his conception differs from mine in that he considered that the middle meatus simply acted as a reservoir in which the pus was ‘retained’; whereas, in fact, the pus is exclusively formed in the middle meatus. From this it appears that Bresgen at that time observed nothing in connection with the superior meatus. (I had already mentioned two cases of isolated disease of this meatus, and the importance of the recesses, at that time quite unknown, is repeatedly referred to. Bresgen⁽⁹²⁾ recently confirmed this.)

I believe that our ideas with regard to the recesses are identical.

‘If in a normal nose one introduces a probe between the middle turbinal and the septum, and pushes it upwards, one frequently reaches a little recess in which the probe is caught. This recess is the favourite site of carious processes.’ The spot thus described appears to me to be identical with that which Bresgen describes as ‘a little cleft underneath the nasal bones, between the upper part of the outer wall and the septum.’ His description appears to be more precise than mine, but I should like to add that this little recess occasionally lies rather farther back, under the lamina cribrosa, or under the anterior end of the superior turbinated body.

Bresgen refers to the possibility of confusing chronic suppurations of the meatūs with chronic empyema, and this

seems to have taken place in one of Brieger's⁽²¹⁷⁾ cases. I have made mistakes in the opposite direction, and have three times diagnosed suppuration of the meatūs in cases which I afterwards recognised to be empyema of the antrum and frontal sinus. The temptation to give a definite diagnosis, say of empyema of the antrum or ethmoidal cells, is considerable, and this is true of nasal suppuration generally when one feels justified in giving an opinion at once. Often weeks of careful observation, and even preliminary operations, are necessary before one can form a conclusion.

Amongst fifteen cases of **circumscribed suppuration without bone disease**, eleven were localized in the middle meatus (two bilateral), three in the superior meatus, and one in the anterior recess of the superior meatus.

Of the first group, three were limited to the anterior recess and the angle of attachment of the middle turbinal, and one affected one of the posterior recesses towards the back of the meatus and in front of the posterior ethmoidal cells.

Of the latter group, one case was limited to the upper recess. The symptoms were not generally severe; in four cases there were secondary affections of the larynx, and in four there were severe headaches and aprosexia, which required the typical amputation of the middle turbinal for their radical cure.

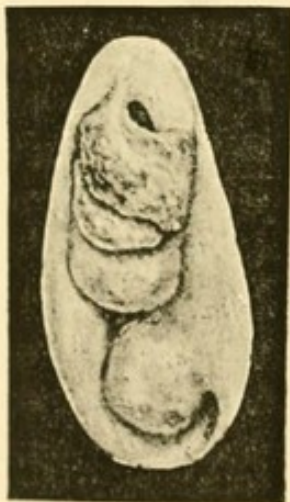


FIG. 3.

Otherwise it was sufficient to remove secondary thickenings of the soft parts, and order an alkaline lotion to be sniffed up, in order to cure the symptoms, though not always to stop the secretion.

Even in this mildest form of suppurative disease it was almost always necessary to expose the affected part freely in order to get a cure.

Rhinoscopically, thick lumps or masses of mucus might generally be seen, either lying in the lumen of the meatus or occupying the affected recess or fissure, from which they could be extracted with the probe.

In some cases there were also swellings and lobulated thicken-

ings on the anterior end of the middle turbinal. Fig. 3 is a drawing of such a case, and shows besides, what is not usual, a glimpse of the anterior recess. The course of these cases is extremely chronic: the shortest duration (in mine) was one year; the longest, probably over thirty years.

The only complication I observed was empyema of the ethmoidal cells on the opposite side in one single case. I append the histories of a few cases.

CASE 129.

Circumscribed Suppuration in the Recess of the Middle Meatus. 'Post-nasal Catarrh.'

Miss C. H., aged 22, complains that for the last year she has suffered from 'phlegm in the throat,' especially in the morning, when she is troubled with retching and hawking in her efforts to get rid of the secretion. The nasal secretion is also increased; the head is free.

The rhinoscopic image looks normal, but on the outer side of both middle turbinals the probe comes in contact with a smooth, bare, bony surface, which crackles under pressure. Touching this surface causes severe headache.

Both areas were cauterized in two sittings. This caused at first some increase of secretion, but it then quickly diminished, so that in four weeks the secretions of the nose and throat were normal.

Probing showed that the bone was again covered and no longer painful when touched.

CASE 130.

Circumscribed Suppuration in the Recesses of the Upper Meatus of Both Sides. 'Post-nasal Catarrh.' Maceration of the Vocal Cords.

Miss C. S., aged 17, has been very hoarse for six months, ever since she had a severe cold in the head. In the morning there is often complete aphonia, and much difficulty in getting rid of tough yellow secretion by hawking and blowing the nose.

On examination, the larynx in general is paler than usual; both vocal cords are discoloured, dirty grayish-white in hue, and uneven on the surface; the epithelium loosened; voice very rough, and often suddenly breaking.

The posterior wall of the pharynx, the fornix, the interior

of the nose, especially the anterior part of both middle turbinals, are covered with tough muco-pus. The posterior ends of both lower turbinals are pale, and show papillary degeneration. With the probe the origin of the secretion may be traced to the very deep recess of the superior meatus; but the bone is not exposed nor rough. Solid nitrate of silver was applied, melted on to a probe, and this produced a copious serous discharge, like an acute cold in the head, till the next day, but no pain. After two days the secretion had greatly diminished; only a little mucus, almost white, was visible in the throat and nose.

After being brushed three times with nitrate of silver, the vocal cords lost their uneven appearance and became redder and broader, the voice being much improved. In a little over three weeks the secretion had disappeared and the voice was normal.

The above case shows very distinctly the direct influence of irrigation with pus upon the structure of the vocal cords, for the change in so short a time, especially the becoming red again, could hardly be due to three brushings with nitrate of silver.

When pus stagnates in narrow clefts, it may cause disturbance of nutrition, and finally death, first of the soft tissues and then of the bone. This is not peculiar to suppuration of the meatūs, but occurs also in empyema. Sometimes, again, one finds erosions on the turbinals, or other parts of the ethmoid, at a distance from the seat of the disease, in places where pus accumulates in narrow fissures. Knapp⁽⁷⁰⁾ records the dissection of such a case, and I have already mentioned one of my own (see p. 33).

Such changes do not by any means prove that the suppuration originated in these ulcerated spots, and when they affect the ethmoid bone they do not necessarily indicate an original empyema of the ethmoidal cells.

Now, if I take as the second group of **circumscribed suppurations** those **in which there is disease of bone**, I do so not because these ulcerations of bone are in any way characteristic of a definite process, but because their occurrence in circumscribed suppurations of the meatūs is calculated to change the clinical picture and the prognosis, and supplies definite and pressing indications for treatment.

The symptoms are more distressing and severe; headache, sometimes most intense, occurred in one-half of the cases, and was the most prominent symptom. In six cases out of twenty-two it was regarded as the disease, and had driven one patient to attempt suicide. The pain was chiefly supra-orbital and temporal.

In addition, the suppuration is more copious and more obstinate; in two cases there was fœtid crust formation and atrophy. (See *ozæna* cases, pp. 66 and 67, Cases 17 and 24.)

Polypi were only observed three times: twice small and solitary, once multiple and recurrent.

In addition there were, as in the milder form, multiple enlargements, granular or lobulated, of the anterior end of the middle turbinal, and on one occasion there was permanent swelling of the lower turbinal.

This latter affection had been treated elsewhere with caustics and the cautery on several occasions without success, but with the discovery of the true cause and its removal, the secondary swelling and secretion was cured. Turbinal engorgement in a less degree occurred several times, in two cases obstructing the breathing.

As regards the localization: it was fifteen times in the recess below the upper turbinal; four times high up on the roof of the nose; five times on both sides; seven times in the middle meatus on the lateral aspect of the middle turbinal; twice not noted.

In the above calculation twelve bilateral cases are reckoned twice.

Treatment must consist in cleansing the diseased bone and providing permanent free drainage for secretions. The latter object is often hindered by the close contact of the middle turbinal with the septum and outer wall. This leaves only a very narrow cleft through which the pus can escape, and the inevitable result is retention of discharge, which gives rise to severe disturbance. In such a case, true hypertrophies, if present, must be at once removed, together with as much of the middle turbinal as is an obstacle to free drainage.

The hypertrophies may often be removed with the hot snare,

but the turbinal demands the typical amputation previously described.

Where the caries was limited, I have several times tried to destroy the diseased part with solid nitrate of silver, for the sake of avoiding an 'operation'; but experience of an unpleasant kind has shown me that an application of this sort to bone which is still inflamed is excessively painful, whereas if applied later during the healing process it provokes almost no reaction.

I cannot, therefore, confirm Michel's⁽¹³⁷⁾ remark that 'the more healthy mucous membrane there is on the middle turbinal, the more intense the headache which results from these cauterizations'; on the contrary, I conclude that in the cases of 'chronic catarrh' which he treated in this way the bone was diseased; for I have come, as the result of repeated experiences, to regard this reaction after cauterizing with nitrate of silver as almost pathognomonic of caries.

Naturally, then, I have given up this method, and prefer to freely expose the diseased part, as being more certain and giving less pain. If exuberant granulations spring up later, it suffices to scrape or burn them, as in any other superficial wound.

The success of treatment is excellent if radical methods be adopted.

In illustration of this subject, several histories of cases are subjoined.

CASE 131.

Suppuration in the Recess of the Right Superior Meatus with Caries, following Pneumonia. Post-nasal Catarrh and Catarrh of the Larynx.

Mrs. E. E., aged 31. Had pneumonia eight years ago, and ever since has complained of right frontal headache and a copious accumulation of tough yellow mucus in the throat, necessitating much tiresome retching in the morning before it can be expelled. The headache is continuous, and often very severe, and of late years hoarseness has become a very frequent symptom, interfering seriously with the patient's practice of her profession as a singer.

On examination, the soft palate is of a dark red colour, somewhat swollen, and deeply injected; the posterior wall of

the pharynx is hyperæmic and spongy-looking, and covered with tough mucus which flows down from the naso-pharynx. The larynx is generally injected, vocal cords discoloured, grayish-red, broader than normal and somewhat uneven. Adduction sluggish. Rhinoscopic image normal.

The larynx improved so much after being brushed with nitrate of silver that for a long time no symptoms were complained of. As they began to reappear, however, more searching inquiry was made, and the facts mentioned above were then first elicited.

The persistent headache in particular led me to examine with the probe, and circumscribed caries was found on the inner side of the right middle turbinal in the recess I have described. Touching this spot induced pain similar to that of which she complained.

The diseased part was cauterized with nitrate of silver melted on to a probe. This was followed by extremely severe headache during the next few days, and the patient did not come back to see me for ten days. In the fissure between the middle turbinal and the septum was wedged the crust resulting from the former cauterization. This was removed, and the recess was irrigated through a small straight cannula. The pain at once abated, and had completely and permanently disappeared by the next day. The secretion in the throat also quickly ceased from that time, so that the patient was relieved of all her troublesome symptoms.

Subsequent examination with the probe showed that the previously exposed bone was covered over. The patient was quite well two years afterwards.

CASE 132.

Suppuration of the Middle Meatus with Caries of the Middle Turbinal.

Mrs. K. S., aged 51, has suffered for years from occasional headache, which during the last few months has become continuous in the forehead and temple. Pain and loss of sleep have greatly reduced the patient, and she has a tendency to faint. The nose is blocked; secretion escapes by the throat. There is a lobulated hypertrophy of the anterior end of the left middle turbinal, and a thin coating of pus on both middle turbinals. The probe detects rough bone on the outer side of the left middle turbinal; the part is painful when touched, and the pain shoots into the head.

The typical amputation of the anterior end of the left middle turbinal was at once performed, and the headache immediately

ceased. Two days later: no return of pain, wound dry, almost no secretion; the suppuration was cured, and permanently so.

The history of a third case is given under Case 24, p. 67.

If one compares the above observations with the literature of 'chronic rhinitis,' etc., one cannot doubt that the condition has been frequently observed, but its origin has rarely been explained, and still more rarely treated.

Observers have often been struck by the significant symptoms, and many of my readers will probably say to themselves, 'I have seen this and that many a time.' Granted; but let me caution you not to fall into the opposite error, and accept as a matter of course, without further criticism. It has now been proved by abundant experience that hypertrophies and congestions of the middle and lower turbinals which were formerly ranked and treated as independent diseases, are frequently due to circumscribed suppuration, either with or without disease of bone. (Empyema of the antrum and frontal sinus sometimes give rise to the same appearances, but much less frequently.) Hypertrophies pure and simple, without other disease, I have, of course, seen often enough, **but always without suppuration.** There is nothing new in the symptoms, but only in the recognition of the fact that one has to do not merely with a chance accumulation of secretion, but with a focal disease. That is the salient point of the whole matter.

Unquestionably Woakes⁽¹⁴⁶⁾ came very near the truth with his 'necrosing ethmoiditis.'

Jacoby's⁽²¹⁸⁾ and Kahsnitz's⁽⁸²⁾ observations also, no doubt, include cases such as I have described, and yet they did not advance us a single step, for the observations of the former were obscured by theoretical speculations, and the latter neglected all the methods of examination that might have sufficed to explain the seat and kind of the suppurations which he recorded in the middle meatus.

Kahsnitz's paper on 'Caries of the Nose' is of a very general nature, and obviously includes the most diverse processes.

Moldenhauer⁽⁸³⁾, in his 'Erkrankungen des Nasengerüsts,' took a bold step forward, for it did not escape his keen obser-

vation that the 'local accumulation of pus' must correspond with a local focus of disease, which he indeed discovered in his six cases, in extensive disease of the bone on the outer side of the middle turbinal. Unfortunately, he did not pursue his investigations farther, so that it is impossible to ascertain whether the appearances were due to suppuration in the meatus or in the adjacent cavities. Thus it comes about that Schäffer is the only observer of earlier times to whom we owe a concrete observation on caries of the ethmoid.

In 1885 he published the following case⁽⁸¹⁾ :

'Mr. R., aged 46. A necrotic area as big as a shilling on the right middle turbinal scraped out. Cure in three months. The patient had suffered from severe headache.'

This is really the only case I can reckon with certainty, for in the series of cases of ethmoidal disease which he published later, the extreme baldness of the reports makes it impossible to recognise the source of the disease.

The other day Seifert⁽⁸⁹⁾ published a series of cases which presented the same features as mine and confirm them.

D. SUPPURATION IN THE NASO-PHARYNX.

SUPPURATION in the naso-pharynx appears about equally under the guise of nasal suppuration and throat suppuration, according as the secretion finds its way forwards or backwards. The acute forms are decidedly rare.

It was not known till recently that there are true post-nasal phlegmons which run their course high up above the soft palate, and have nothing whatever to do with peritonsillitis. I do not include those so-called phlegmonous inflammations of the adenoid tissues which Wendt⁽²¹⁹⁾ observed as occurring after operations involving them. Only Schech⁽⁸⁴⁾ briefly mentions phlegmons of the throat as follows: 'The objective signs of phlegmonous inflammation of the naso-pharynx consist in considerable redness and swelling, especially of the adenoid tissue and the mouths of the Eustachian tubes. The swelling is generally so great that the lumen of the space is completely filled up, and nasal respiration becomes impossible. The secretion is purulent, and sometimes bloody.' That is the only picture I have been able to find of phlegmonous disease of the naso-pharynx.

Now, there is no doubt that this affection can never be quite separated from the ordinary phlegmons of the throat as they affect the velum and the tonsils.

On careful examination it will be found, in far more cases than would have been supposed, that the naso-pharynx is affected with phlegmon at the same time as the throat. Less frequently this becomes apparent from the fact that the pus finally escapes only through the nose. There may be redness and tense bulging of the soft palate of the usual kind, but, nevertheless, in many cases it is impossible to find a spot at

which the pus is 'pointing' suitable for incision, till suddenly there is a gush of pus from one or both nostrils, and relief follows immediately.

I have seen this several times, and the diagnosis is, of course, not difficult.

But although the affection cannot be strictly separated, either anatomically or ætiologically, on the one hand from the phlegmons of the throat, and on the other hand from the phlegmons of the nasal mucosa, yet, practically, cases come under observation which must be assigned to a separate and distinct clinical group. Such cases are the **isolated phlegmons of the naso-pharynx**, which claim our interest all the more because their situation makes direct scrutiny impossible, and they only come under observation when attention is specially directed to them. Their clinical importance as the starting-point of grave disease of a septico-pyæmic cryptogenous kind is evident from the following case.

As far as I know, only Laker (²⁰¹) has paid much attention to this subject. He reports two cases—one of 'acute post-nasal affection with typhoid symptoms.' Both his patients were strong men.

The first patient was seized with rigors and diarrhœa fourteen days after a severe chill. On admission to hospital there was great prostration and stupor, tremulous tongue, and meteorism. The nose was somewhat obstructed; the temperature ranged from 102° to 105.5° F. After a few days, redness and swelling of the pillars of the fauces were noticed, and posteriorly a band of grayish-green muco-pus 2 cm. in width, extending downwards. The naso-pharynx was so filled with crusts and pus that it was impossible to blow the nose. Direct irrigation removed large masses of fœtid, partly-dried secretion, and immediately afterwards the temperature fell to 98°, full consciousness returned, and general improvement set in.

Posterior rhinoscopy was now possible, and showed that the mucous membrane of the naso-pharynx was much swollen and injected, that of the nose slightly so. Bacteriological examination revealed the *Staphylococcus pyogenes aureus*, and a peculiar encapsuled bacillus which was very fatal to mice.

The latter organism was found in a second case, similar as regards anatomical changes and course, but devoid of the grave general symptoms.

Whether the constitutional symptoms depended upon the severity of the infection, as Laker supposes, is a question which must for the present await the results of further observations; the sudden subsidence of these symptoms after the irrigation makes me think that very probably the sphenoidal sinus was involved in the inflammation, and that the pressure of secretion retained in it gave rise to the cerebral symptoms. My own experience of this affection is limited to three cases, which, unfortunately, I did not see until they were getting better.

CASES 133 TO 135.

Retronasal Phlegmon.

A student of 23, with an illness of two weeks' duration. It set in with feverishness and great prostration. The nose was blocked, and there was dryness of the nose and throat. About noon of the day on which he first sent for me (having tried gargling, etc., on the advice of his doctor), he had a profuse sweating, and all at once on blowing his nose there was a copious gush of pus from the nostrils sufficient to saturate three handkerchiefs. Nasal respiration immediately became free and he felt much better. When I saw him in the afternoon he was still so weak that I refrained from examination, except to assure myself that the appearance of the throat was normal. Next day there was still a considerable discharge, but more of a muco-purulent character; the nose was coated with dried, and the naso-pharynx with liquid, pus; the septum above and behind was somewhat thickened. He was much improved in strength.

On the second day the secretion was chiefly mucus; posteriorly on the fornix there was still some swelling coated with pus; this was no doubt the seat of the abscess.

The other two cases were those of a girl of 17 and a woman of 45. Fig. 4 was taken from the latter, and represents the final stage of the process. The course was almost typical, as described above.

I owe to Dr. Bino-München, the communication of a similar case occurring in general practice, and confirming my experience.

A gentleman of 45 had been ill for four days with great prostration, nasal obstruction, and locking of the jaws. Speech nasal; slight redness of the soft palate. Suddenly, in the

night, there was a free gush of pus from the nose, the locking of the jaws and all the other symptoms disappeared, and rapid recovery took place.

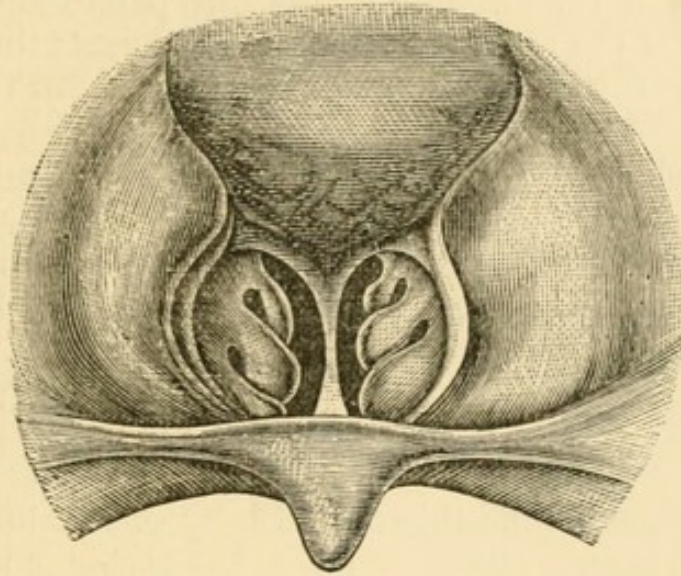


FIG. 4.

The origin of these isolated phlegmons varies, like that of other suppurations about the throat.

As phlegmons involving the fauces were found to be due in some cases to infection from primary nasal suppuration, so it is possible that the same may be true of the pure phlegmons of the fornix. Erysipelas may be the direct cause of other cases.

The connection between erysipelas and angina is no longer new. One has seen, for instance, one member of a family attacked by erysipelas, and another by primary erysipelas of the fauces. But it is always interesting when the identity of the processes is clearly proved by extension to the skin.

CASE 136.

Retronasal Erysipelas and Erysipelas of the Face.

A man of 40 was taken ill with almost typical phlegmonous inflammation of the left half of the soft palate; there was marked obstruction of the left nostril from the beginning. I saw him about the eighth day. The soft palate was much reddened, especially on the left side, tense, but not very much swollen; on palpation it seemed to fluctuate almost everywhere. Much pus was with difficulty evacuated from the left nostril. Posterior rhinoscopy was, on account of the closure of the jaws, impossible. An incision into the apparently fluctuating soft palate, though carried very deep, did not reach pus.

On the fourth day of my observation of the case erysipelas showed itself at the left ala nasi, and spread from there over the face. The discharge of pus from the nose became less after a few days, the swelling of the soft palate subsided, and some days after the recovery of the internal parts the erysipelas got well under the application of a bandage round the head.

This case shows us a primary retronasal erysipelas spreading forwards and outwards in its course. I have said above that the difference between pharyngeal and retronasal phlegmon is practically only one of localization, and I will here add that the condition of phlegmon must be distinguished qualitatively from the catarrhal or follicular form of acute inflammation of the naso-pharynx. This latter form seems to receive but little attention, so I take this opportunity of recalling it to the minds of my readers, although, not being attended by suppuration, it has nothing to do with our present subject. A more minute description of this not very common affection will be found in Moldenhauer (⁸³) and Schech (⁸⁴), and to this I refer my readers.

But I may just mention that when it occurs alone this affection is apt to be overlooked from attention not being directed to it—all the more as the parts of the throat which are open to direct scrutiny may appear to be perfectly normal. A useful indication is derived from the fact that the patients are taken ill in exactly the same way as is usual in follicular sore throat: there is lassitude or prostration, headache, feverishness, possibly rigors; and nearly always pain on swallowing is complained of. Nasal obstruction, which would more readily direct attention to the diseased parts, is rarely mentioned, partly because it is not always complete, and causes the patient little trouble. Only in children is it a more prominent symptom (Wiesner ²²⁰).

Often, in spite of the pain in swallowing, the soft palate is hardly reddened at all, and this first wakes one up to the fact that something else must be at the bottom of the symptoms. The feverishness and other symptoms, local and general, rapidly disappear after thorough cleansing of the naso-pharynx, followed by the application of solid nitrate of silver.

The sequelæ are sometimes of importance, for I have seen

permanent enlargement of the pharyngeal tonsil occur, and I have no doubt that the 'origin' of adenoid vegetations after measles, scarlet fever, etc., takes place in the same way, just as tonsillar hypertrophy is not rarely the consequence of frequent infection. (Frequent infection of the tonsils causes hypertrophy, and hypertrophy of the tonsils facilitates frequent infection.)

Chronic Suppuration in the Naso-pharynx

is most frequently kept up by adenoid vegetations. Perhaps the expression 'matter,' as applied to the secretion in question, may appear offensive, but as a matter of fact it is much more purulent than mucous in character. It is rarely white in colour, but ranges from yellowish to pure yellow, and sinks to the bottom in a vessel of water. It consists chiefly of pus corpuscles.

For rapid and easy diagnosis this secretion is of great importance.

The open mouth and facial expression, otherwise so characteristic of adenoid vegetations, may be caused by nasal obstruction, however brought about; but if one sees, along with these symptoms, that the posterior wall of the pharynx is covered with muco-pus which comes from above downwards, one may be certain that the nasal obstruction is due to adenoid vegetations. Often enough this excessive and ugly secretion brings the parents to the doctor, either when it causes continual hawking or when it is blown out through the nostrils.

It is a condition which very frequently calls for professional consultation. There is, for instance, the eczema affecting the entrance of the nostrils and the upper lip, a condition which is caused almost exclusively, in my experience, by the mucopurulent discharge of adenoid vegetations, and which can only be definitely cured by their removal.

This form is identical with the so-called strumous eczema, which has, of course, nothing to do with tuberculosis. When one sees a child with a markedly purulent discharge from the nose, and eczema of the upper lip and entrance of the nostrils, one ought to think at once of the naso-pharynx, even when the patient is not suffering from mouth-breathing and its

results. In the majority of cases adenoids will be found to be the cause.

I have several times seen very profuse discharge of pus from the nose in children—so profuse that in an adult one would at once have concluded that there was an empyema—and have traced it to the presence of ‘adenoids,’ and cured it by removing them. In some cases this discharge was almost the only symptom. Of course, one must not lose sight of the fact that chronic empyema does occur in children, though much less frequently than in adults, and this possibility must especially be borne in mind when the discharge is unilateral. In this connection I can recall three cases in girls of from 8 to 10 years of age in whom there was unilateral suppuration with mouth-breathing. A guarded prognosis was given, and the adenoids were removed. The discharge continued in undiminished quantity, and proved to be due to empyema of the antrum. With the cure of the empyema the suppuration ceased. In the same way, I have several times in young persons seen suppuration persist after removal of adenoids, and have traced it to disease in one of the meatūs.

Even bilateral suppuration is not above suspicion. When it occurs after removal of adenoids, it is generally due to enlargement of the lower turbinal (see p. 184), but on one occasion, in a girl of 13, I found that it was caused by bilateral empyema of the antrum.

Practically there are no other chronic suppurations originating in the naso-pharynx.

Tornwaldt's disease, so called, is nothing more than a suppuration in a recess of the adenoid tissue. It may give rise to the clinical picture of ‘ozæna,’ as we have seen from the observations on pp. 64 *et seq.*

A class of cases deserving of particular attention is that in which secretion seems, even under careful scrutiny, to come from the walls of the naso-pharynx, but in reality flows out of neighbouring cavities into the naso-pharynx. This occurs in empyema of all the accessory cavities, but most frequently in disease of the sphenoidal sinus, under which heading the subject will be more minutely treated.

E. SUPPURATION IN THE MAXILLARY ANTRUM.

ACUTE inflammations are rarely observed, practically only when the severity of the symptoms, or of the secondary results, compels operative interference. Whether the acute are in general more frequent than the chronic forms it is impossible to say as long as we are ignorant of the natural spontaneous course of acute empyema. The possibility of spontaneous cure undoubtedly exists; the chances of it have already been discussed (p. 171).

Judging from the comparative frequency with which acute inflammations of the antrum are found in the bodies of those dying of infectious diseases, and comparing it with the relative rarity of chronic empyema, the conclusion has been drawn that acute empyema generally heals spontaneously.

Against this conclusion we must protest.

The cases of measles, typhoid, etc., which come to the post-mortem room are, one must suppose, the most severe of their kind, and it is absolutely inadmissible to draw conclusions as to the frequency of certain secondary affections, such as empyema and otitis, in the mild, non-fatal cases, from the statistics furnished by the severe fatal cases. Of the relation of the former to the latter of these we are as yet quite ignorant, and would rather not guess.

But even supposing it proved that many acute empyemata heal spontaneously, it would not be very surprising, nor would it justify Harke's expressed 'doubt of the utility of many therapeutic measures.' For the very great majority of such measures are directed against chronic empyema, the spon-

taneous cure of which is as little open to discussion as that of chronic mastoid suppuration.

Acute empyemata are distinguished chiefly by the severity of their symptoms. In spite of this, they have hitherto rarely been recognised, their real nature being masked by the signs of a very bad cold in the head or a severe toothache. Besides, proof is difficult, for exploratory puncture is not so lightly undertaken.

Case 107 (reported at p. 152) was almost certainly an acute empyema of the antrum, and shows how complicated the course of an acute case may be.

In a second case the illness began suddenly with rigor, severe one-sided headache, and feverishness (103° F.). The cavity was punctured on the third day, and thin grayish-yellow foetid pus oozed out. The crown of the second molar was gone, but the roots were intact. Puncture from the alveolus was not sufficient; a large opening had afterwards to be made with the chisel.

In this case one nostril was completely blocked, even in the posterior naris.

A third case began with acute disease of a tooth. Three months previously the second left molar had been extracted, and six weeks after that, rather suddenly, headache set in, and foetid pus began to come from the nose. Next day the pus suddenly broke through the empty alveolus, and the discharge from the nose ceased at once. In the left nostril the mucosa was somewhat reddened; in the alveolus there was a bloody discoloured mass; the opening into the antrum was wide, and the mucosa lining the cavity seemed thickened. The discharge was scanty, but very foetid. The cavity was scraped out. The patient himself undertook the irrigation, and reported two days later that there was no more secretion. Whether the cure was permanent I do not know.

In a fourth case chronic suppuration was present on the right side of the nose, and acute suppuration had set in on the left side a few days before I saw the patient. The first two molars were carious; both were extracted, and on the right side the antrum was punctured and blown through. Three days later suppuration had ceased on both sides.

A fifth case occurred in a patient with extensive caries and empyema of the ethmoidal cells, and the acute empyema developed under my own eyes, no doubt by direct extension. The discharge at first was a brownish-red mucus, and then

pure pus. The antrum was opened from the lower meatus and regularly washed out. In about four weeks it healed.

It is evident from the foregoing descriptions that acute empyema might easily be confounded with acute suppuration of the meatus. Diagnostic operations only come under consideration in the more severe or protracted cases, and so no doubt many cases are, harmlessly, overlooked.

Treatment must be conducted on the same principles as in the chronic cases (which see), unless immediate relief be obtained, as in Case 107. In the diagnosis two things are often confounded, viz., circumstances which justify the suspicion of empyema, and actual proof of the presence of pus.

It is most important to know what are reasonable grounds of suspicion, for on the one hand they direct attention to the cavity, and on the other hand they must be of a certain sufficient strength to justify the operations which are indispensable to an exact diagnosis.

In the first place, there is the **quantity of the discharge** to be considered. Considerable quantities escaping at one time can only originate in one of the larger cavities, such as the antrum or frontal sinus. Further, there is **the situation in which the discharge appears**. Pus in the middle meatus must always raise a suspicion of empyema of the antrum, although not unfrequently it comes from the anterior ethmoidal cells or the frontal sinus; or from the meatus itself. **Bulging of the inner wall of the antrum into the middle meatus** is a very rare sign, but when present it is, of course, highly suggestive. The **position of the head in which pus most easily escapes** from the cavity is that in which the ostium assumes the lowest position, *i.e.*, with the head inclined forward and towards the opposite side. The suspicion is strengthened if with the head in this position pus is seen to flow into the middle meatus, and if the patient tells us that on waking in the morning and sitting up in bed a flow of pus takes place from the nose and throat, which till then had been free from discharge. Pain and **tenderness to pressure over the upper jaw** are rare, but very suspicious symptoms. Bulging of the anterior wall is not a sign of latent empyema. **Fugitive redness of the skin over affected cavities,**

which Avellis⁽²²¹⁾ describes as a significant symptom, is quite unreliable. I have rarely observed it, and I have seen it appear on both sides when only one side was diseased.

Disease of neighbouring teeth increases the probability of any suppuration which may be present originating in the antrum, but the absence of dental disease proves nothing at all, as there are cases enough which are not dental.

One must, however, beware of excluding empyema of the antrum because none of the suspicious circumstances mentioned above are present; for the cases which, so to speak, sail under false colours are very numerous. If one is content to recognise only those cases that compel attention, no doubt the very great majority will be overlooked. It is by no means rare for pus from the antrum to be seen only in the lower meatus, or not in the nose at all, but only in the throat. I have seen pus high up on the roof of the nose, and again only posteriorly in front of the sphenoidal sinus, yet it did not originate in either of these two situations, but in the antrum of Highmore. This is easily understood when one has seen the ostium—in one case a little hole high up in front; in another case a broad cleft deep down above the lower turbinal, so that the pus flows exclusively backwards or downwards out of sight.

It is well to be suspicious if one cannot explain satisfactorily the origin of a discharge, or if it continue when it ought to cease, *i.e.*, when the regions from which it is supposed to come are under efficient treatment.

The diagnosis can only be established by the direct proof that there is pus in the cavity.

A probe can sometimes be passed through the normal ostium, but rarely, and only when the nasal cavity is wide. The escape of secretion by the side of the probe is very seldom seen, but it is, of course, conclusive when it does occur. One may try to introduce a cannula into the opening (Hartmann's tympanic cannula, or the frontal sinus tube, Plate II., Fig. 2), and during careful inspection of the nose blow air through by means of a Politzer's bag. Crepitations betray the presence of secretion, or blood may give rise to the same sounds if the manipulations have caused bleeding. Only the appearance of

pus blown out through the ostium is conclusive, and as the pus may flow backwards, and so escape observation, it is essential to keep the posterior part of the lower turbinal well in view.

As a preliminary measure the most careful cleansing of the nose from all secretion, with wadding and forceps, is important, especially the floor of the nose and lower meatus, in which masses of secretion are apt to lie concealed. Further, one must be certain that no pus finds its way in from other regions, down from above, for instance. For this purpose one uses the plug to dam off other regions (see p. 162), and in this way empyema of the frontal sinus or ethmoidal cells may be excluded. Till I discovered this method I used often to find myself at a loss. One introduces a pledget of wadding close to, or into, the opening of the frontal sinus, as far as it is accessible, *i.e.*, into the upper and anterior part of the middle meatus, not forgetting that the frontal sinus very often opens posteriorly and must be plugged farther back.

It may also be necessary to plug between the middle turbinal and the septum, when pus appears posteriorly and it is doubtful whether it comes from the sphenoidal sinus or posterior ethmoidal cells. I have several times seen the diagnosis of sphenoidal empyema made, when in fact the pus came from the antrum.

If, as is generally the case, one cannot get in through the ostium, and is obliged to fall back on exploratory puncture, the strictest precautions must be observed.

Two routes present themselves: through the socket of a tooth, or through the mesial wall. The alveolar route is only available when there is already an empty socket, or a diseased tooth which requires extraction. To extract a sound tooth is not a justifiable proceeding, as it can be quite well avoided.

Sometimes when a diseased tooth has been present I have punctured the suspected antrum through the alveolus and have washed it out; and in cases where the cavity has proved to be empty I have seen no bad effects follow this operation. For the puncture I use an ordinary shoemaker's awl, with which it is possible to make a very small hole. If nothing be found, all liquid is blown out of the antrum with the air-douche

(Politzer's bag), and the alveolus is then packed with iodoform gauze and left for a couple of days. It heals quickly, and no infection of the antrum takes place. This method of puncture must not be employed when the diseased tooth has caries of the root. In such a case, if it be purely a question of diagnosis, puncture from the interior of the nose is preferable, for it is quite possible (if the antrum is intact), that pyogenic organisms may be conveyed from the septic alveolus to the cavity, and an empyema thus set up.

Additional caution is, of course, called for when the antrum and the alveolus already communicate. If the antrum is still healthy, it may very easily be infected. An unpleasant experience of this sort befell Bordenave⁽¹⁹⁾. The tooth had a carious crown, but healthy roots; the alveolus opened above into the antrum. A few days afterwards the antrum discharged pus. An experience of my own shows that even in such circumstances modern asepsis removes the danger. Suspecting an empyema, I extracted a first molar with caries of the crown. On the roots there was a periodontal swelling as big as a bean, which had projected into the free cavity of the antrum. It was composed of small-celled tissue. Under the use of an iodoform gauze plug the opening healed in two days without suppuration.

Of late years I have practised exploratory puncture chiefly from the lower meatus. For this purpose a straight, slender trocar has seemed to me the most suitable instrument. (The one I use is 11 cm. in length, and 2 to 2½ mm. in thickness.) With a straight instrument one can always regulate the direction; with a curved one like Krause's one must follow the direction of the curve; and when the antrum is narrow one may strike the outer wall before one has penetrated to a sufficient depth.

Having applied 20 per cent. cocain, the trocar is introduced under the anterior end of the lower turbinal, in the hollow between it and the floor of the nose. The point is directed outwards by pressing the back part of the instrument firmly against the septum. This manœuvre is intended to prevent the point from slipping in between the periosteum and the bone instead of piercing the wall. To the same end a strong,

firm pressure is necessary. The bone is rarely thick enough to prevent penetration, but if so, one must use stronger instruments (such as a thick trocar, a drill, or a common shoemaker's awl).

If pus flows from the tube, or can be sucked out by aspiration, the question is settled. Unfortunately, that is rarely the case. As a rule, one must take other measures.

A Politzer's bag is attached to the canula, and, while the interior of the nose is most carefully scrutinized, air is blown through. Auscultation is important; crepitations betray the presence of fluid, even if one cannot see it. But even quite small quantities of secretion are blown out of the cavity into the nose, and that is the great advantage of this hitherto unknown method as compared with the injection of liquid. The latter may come away perfectly clear without the cavity being empty. When the contents are lumpy and contain much mucus, it very frequently happens that while the water runs away clear in front, the lumpy masses are driven backwards, and at the most one may see them the next time one examines, but without being able to determine with certainty whether they may not in the meantime have flowed down from some other cavity. Frequently, however, they are not seen at all, having passed backwards into the throat. It is absolutely necessary while the cavity is being emptied that the interior of the nose should be inspected, and for this purpose the above method is indispensable. But in spite of its exactness it has disadvantages. Even if one has dammed off neighbouring cavities in the way described above, it is often impossible in narrow noses, which afford no proper view of the middle meatus, to say whether secretion which has apparently been blown out of the antrum may not just have been lying in the hiatus semilunaris, and have come from somewhere else.

Occasionally transillumination may be useful. If the cheek appeared dark before the secretion was blown or washed out, and afterwards cleared up, then one may conclude that the secretion which was removed came from the antrum. Unfortunately, in difficult cases with little secretion, the differences in shade are very slight or entirely absent, so that one is

very fortunate if one's diagnosis is much helped by transillumination.

If the result be negative or uncertain, that must not be taken to mean that the cavity is healthy. A negative puncture proves nothing at all. When sufficient grounds of suspicion are present, the proceeding must be repeated on other days, for I have often enough found suppurating cavities to be quite empty at times. I have been obliged to repeat the puncture as many as four times, in some cases, before attaining certainty, and I have had the satisfaction of furnishing proof of the correctness of this hard-won diagnosis by complete cure following the operation.

One must examine again and again, if possible early in the morning, when most of the secretion formed during the night is still in the cavity. Such extraordinary difficulties in diagnosis are not rare, but the contrary. If after repeated punctures one cannot find pus in a cavity which one strongly suspects, it may be because it never accumulates in the cavity, but drains off continuously, either backwards or into the lower meatus. In such a case one may resort to artificial damming back of the secretion into the cavity. The hiatus semilunaris may be plugged with wadding, or, if that does not afford sufficient control, the whole of the middle meatus, and the nose examined after some hours, or next morning, when the accumulated secretion, on account of its increased volume, will be more easily detected.

In the same way one may distinguish between frontal and antral empyema by damming off the frontal sinus at the infundibulum for several hours. If no discharge appear while the plug is in, the antrum may be excluded. But the conformation of the nasal cavity and the turbinals is frequently such as to render this proceeding unsuccessful, and when the severity of the symptoms justifies it, one must finally proceed to expose the hiatus semilunaris by the typical amputation of the middle turbinal.

As such cases are very frequently complicated with ethmoidal suppuration, this operation is indicated in any case on therapeutic grounds.

In conclusion, the occurrence of partitioned antrum must be

mentioned, as it is a condition which may make shipwreck of the most exact diagnosis. Undoubtedly septa are rare, and especially complete septa, which shut off separate chambers. They are capable of recognition *in vivo*.

Zuckerkan dl⁽²²²⁾ records that Tomes observed a case in which the cavity was divided into compartments by several bony ridges. Hyrtl⁽²²²⁾ has described numerous partitions, and Zuckerkan dl himself noticed the frequent occurrence of single folds. Yet he only mentions seven examples in 300 bodies, and in only one case of the seven (*g*) did the partition cause the formation of an accessory chamber, which, however, communicated with the main cavity by an opening the size of a hemp-seed.

The degree of importance to be attached to these few anatomical facts in their clinical aspect, and especially as bearing on empyema, can hardly at present be estimated. An empyema in such a recess or compartment is not likely to remain isolated; it is much more likely to extend through the opening of communication (if such be present), or to break down the partition and fill the rest of the cavity, or, if completely shut in, it may expand and finally perforate the bony walls that surround it, and so appear externally. Practically, in about 100 exploratory punctures I have never had any difficulty from partitions. Twice I have encountered them, apparently consisting of bone, but they occasioned no difficulty in diagnosis. It is somewhat different with regard to treatment. By leading to the accumulation of secretion in more or less inaccessible situations, they are apt to be troublesome. For the method of proceeding in such cases, see under 'Treatment.'

A word with regard to transillumination. Apart from the estimate given above, I have as yet only got a decided result in one solitary instance.

CASE 141.

A lady complained of pain in the alveolar region and the canine fossa after the extraction of a diseased tooth. The remaining teeth were pronounced healthy by a dentist. Examination of the nose was negative, but pressure in the canine fossa was very painful.

On transillumination, both sides of the face and both eyes were brilliantly lit up—more so than I have ever seen them before or since. The extraordinary thinness of the bone in this case would have enabled one to detect the least abnormality, and I was thus in a position to exclude empyema from the diagnosis, on the strength of this and other evidence. The subsequent course confirmed this opinion.

On the other hand, it has frequently happened to me, as to many others, to find a cavity dark on transillumination when it yet contained no pus; and to find one clear which was certainly suppurating. Thus, it is a very doubtful aid to diagnosis. Davidsohn's⁽²⁰⁸⁾ modified method of interpreting the results does not alter this. Davidsohn does not consider as decisive the transillumination of the face below the orbits, but that of the eyes, which are said to appear uniformly clear and bright in a normally-formed skull with a flat palate and a clean antrum.

I have not been able to convince myself of the truth of this relation, for, apart from visible deformities, the thickness of the bone is a very important factor, and often in a normal skull with the antrum intact, I have seen the eyes dark; and, on the other hand, I cannot admit that a positive result (*i.e.*, clear transillumination of the eyes) necessarily indicates a healthy antrum.

Then again, a suppurating antrum may, when the secretion of pus is slight, be at times practically empty, or only contain such a small quantity of pus as not to affect the result of transillumination.

Neither can I accept Burger's⁽²²³⁾ modification, according to which, if a subjective sensation of light be felt on transillumination, it indicates that the cavity is empty; and if it be not felt, that it is full. This is open to the same objections as Davidsohn's.

It is evident from what has been said that a positive diagnosis as regards either the presence or the absence of empyema of the antrum, cannot be founded upon the result of transillumination, nor upon any other symptoms. The presence of pus in the cavity is the only decisive proof, and that can only be demonstrated by exploratory puncture and blowing through.

Although the greatest caution is necessary to avoid over-estimating the results of transillumination in diagnosis, yet it is very useful as a measure of control when a recurrence is feared.

Its worthlessness in diagnosis is due to the fact that it does not give any constant result under normal conditions, on account of the very great individual variations in the structure of the skeleton, so that we possess no uniform standard by which to compare different cases. But we soon obtain a standard by which to compare the conditions of the same case.

If, for instance, there is darkening of the cheek, which clears up after the removal of pus, then by comparing the results of transillumination in the same individual under different circumstances, we shall obtain a standard for the particular case.

This is not necessary during the course of treatment, for as long as the cavity remains open the presence or absence of pus can at any moment be readily ascertained by blowing through.

It is often an anxious time, when after apparent cure one allows the artificial opening to close, for one does not know whether healing is sufficiently far advanced to be permanent. Occasionally catarrh comes on, simulating a relapse, and yet one feels reluctant to open up the wound and perhaps disturb the natural course of events. In such circumstances transillumination does good service. If one finds on one or several occasions the same degree of brightness as formerly, one's mind will be much more at rest, supposing, of course, that the bone is thin enough to allow of a definite result. I have applied it in this way successfully several times. I remember particularly two cases in children in which the method did me good service. Suppuration in the antrum had run its course months before, but latterly a slight purulent discharge had set in on the same side, and there was some erosion of the entrance to the nostril. The patients were nervous, restless children, and exploratory puncture would only have been possible under an anæsthetic. Transillumination came to the rescue by showing in both cases exactly the same degree of brightness that had existed previously after the cure. The cause of the suppuration proved to be a small carious area on the middle turbinal. Appropriate treatment quickly cured it.

In cases of nasal tumour, too, transillumination may sometimes afford us indications as to the involvement of the antrum. I had the opportunity of showing a case of this kind, in which the dark shadow on the diseased side, as compared with the bright transillumination of the sound side, was due to the extension of a sarcomatous growth to the antrum in a young person.

The diagnosis of chronic empyema being fairly established, the question of **treatment** arises, and that in every case, as we saw in discussing the subject of spontaneous cure.

Till Küster's time treatment consisted only in irrigation. The idea of it was not only to remove the secretion mechanically, but also to disinfect the cavity. Certain authorities irrigated through the natural ostium, or, at least, thought they did so. Störk (²²⁴) in particular employed no other method of treatment, and claimed for it certainty in curing.

It always appeared to me to be so unreliable, especially from the lack of a counter-opening, that I have never even tried it, and so have no experience to recount. But we have it on the authority of B. Fränkel (²²⁵) that, 'in spite of continuous treatment for over a year, a cure was never attained, though sometimes there was alleviation of pain and discomfort.'

I will not here discuss the arguments for and against this method. To anyone who knows the anatomical relations, and who appreciates the conditions under which infectious processes in general heal, discussion on this subject is quite unnecessary.

As the natural ostium is rarely accessible, holes were bored in various positions, but they were always made very small, and the object aimed at was always the same—viz., the disinfection of the cavity with antiseptic solutions.

A very large number of soluble drugs have been recommended for this purpose till the most recent times, and often with the greatest enthusiasm, each one in turn yielding to the last new 'unfailing' cure.

I have already indicated my opinion of the uselessness of all these applications: the bacteria are not so easily reached that a brief irrigation with a weak antiseptic can destroy them. Observers seem to have entirely forgotten the experiments of

Geppert (²²⁶), who proved in the clearest possible way that bacteria, even on the surface of the body, are too much surrounded with dirt and other superficial coverings to be reached directly by an antiseptic. This applies with still greater force to more internal parts, where the infective organisms are surrounded by a thicker layer of secretion, and by a swollen and degenerated, often necrotic, mucous membrane, which forms a most suitable soil for their growth. The thought that the utmost irrigation could accomplish was the cleansing of the mucous membrane from pus led Krause and Friedländer (²²⁷) to introduce their dry treatment with powders.

In virtue of its longer contact with the diseased inner wall, the powder was supposed to have time to exert its remedial action. Friedländer published some astonishing results obtained by this new method. No second report has appeared, however, and it is perhaps permissible to doubt if the successes have proved permanent; and it may be observed in passing that the successes were not quite new. Hartmann and others had already cured chronic empyemata in a few days by means of irrigation through the natural opening; and my own early cases, treated by a free opening and plugging with iodoform gauze, healed in eight to ten days. So I waited for a further series of similar successes, and, behold! they never came. Finally, by comparing my own results, on the one hand with the published results of great successes from some new proceeding or other, and on the other hand with the statistics furnished by some authors of all the cases they had treated, I came to the conclusion (already announced by Killian) that there are quick-healing and slow-healing empyemata. To put it more precisely, there are cases which, under all circumstances and with almost any method of treatment, invariably heal in the shortest possible time, whilst other cases are always condemned to a protracted course. This must not be taken to mean that it is a matter of indifference what method of treatment is adopted, for there are cases enough—I believe even a majority—in the latter class, which require for their cure the most rational and thorough treatment, otherwise they never heal at all.

In the first class—those which heal readily under all cir-

cumstances—I would first of all place dental empyemata which have not lasted longer than two or three years. In such cases there is as yet no disease of the bony walls of the antrum, a condition which always impedes healing very much. I believe also that easy drainage for secretions, either into the nose or, as in Siebenmann's case, into the mouth, is essential for the rapid cure of these cases.

The most probable explanation of these delightfully rapid cures seems to be that under such conditions as we have described, the simple removal of the cause, *i.e.*, of the diseased tooth, together with a brief freedom of the cavity from secretion, is sufficient to produce a cure.

But equally good results are sometimes obtained in empyemata which are not due to diseased teeth. I may instance seven cases of my own; in five of them the antrum was chiselled open and plugged, and cure was complete in each case in eight days; while a sixth similar case took fourteen days. In one case the alveolar opening was made and dry powder applied, and cure was complete in ten days. The only circumstance I can mention in explanation of these rapid cures is this: no considerable secondary changes were found either in the mucous membrane or the bone; but, on the other hand, in each of the seven cases there was a large collection of secretion—pure pus, not muco-pus—and the fœtor was pronounced.

It has been suggested that the collection of pus in such cases is really a submucous or subperiosteal abscess, raising the mucous membrane (which serves also as periosteum) without causing injury or disease. Setting aside various theoretical objections which I need not further mention, this assumption is contradicted by the results of probing in my seven cases, inasmuch as bare bone was never once felt; it was always covered by mucous membrane.

To assume, in explanation of these facts, that the mucous membrane in the one case is diseased, and in the other case intact, the cavity simply acting as a reservoir for pus secreted elsewhere (as Killian supposes in acute suppuration)—must be pronounced a purely hypothetical view as far as our present knowledge goes.

The second class of cases of empyema comprises those

which are slow to heal under favourable circumstances, and if inefficiently treated never heal at all.

All those complicated with caries and necrosis may certainly be included, and I have already shown that the number is considerable. Whoever believes that he can cure an antrum with carious walls by a short course of treatment, or flatters himself that he has cured such a one in any short period of time, convicts himself of inexact observation.

If the bone be once eroded—that is, deprived of its covering of mucous membrane—it must necessarily secrete, that is to say suppurate, till such time as it is re-covered either by newly-formed mucous membrane or by connective tissue and epithelium. As long as the epithelial covering is absent, the part must go on continuously secreting, though of course only slightly, just as, when a bit of epidermis is removed, the exposed Malpighian layer continually secretes moisture.

Thus the bone must cicatrize before real cure can be spoken of, and for this time is required, even after all the conditions necessary for healing are present. The length of time required depends upon the extent of the damage, which cannot always be ascertained; but under no circumstances and by no method of treatment—and this fact I would emphasize—can the time be shortened, always supposing, of course, that it has not been unduly lengthened by inefficient treatment such as might cause a relapse.

Even the changes in the mucous membrane of the antrum described above (p. 23) require time for their retrogression, apart from direct treatment. When I read reports of rapid cures of cases of this sort by means of irrigation or the application of powders, I can only suppose that the author has not waited for the **relapse**—if one may use such a euphemism. Whoever has sufficient patience will very soon find himself undeceived with regard to optimistic dreams of cure.

Even when caries is present, it is not rare, but rather usual, to find after any interference—even if it consist only in irrigation—that the discharge diminishes so much as almost to disappear, particularly in the case of the antrum. Let me recall some facts about otitis media suppurativa.

In fœtid caries of the attic, fœtor and discharge will some-

times disappear for days after a single direct irrigation, and if the treatment be continued they disappear for so long that an apparent cure takes place, and the patients are dismissed or stay away.

I have treated several such cases, with very fœtid discharge and demonstrable caries, which long before had been dismissed, or had withdrawn from treatment elsewhere. It is exactly the same in empyema of the antrum. Cure of the diseased bone can only be accomplished by direct operative treatment, by the removal of necrotic portions, the freshening up of indolent granulating surfaces, and, in addition, by the permanent removal of those conditions which favour relapse.

As the result of many experiences, accumulated in the course of years, I would also include amongst the slowly-healing empyemata those more catarrhal forms in which the discharge always consists of thick lumpy mucus, partly yellow, partly amber-coloured, partly gray. The chronic inflammatory changes in the mucous membrane which keep up this sort of secretion seem to be particularly refractory to retrogressive changes. Anatomical proof of these changes is as yet wanting. When Zuckerkandl⁽²²⁸⁾ constructed his picture of empyema and catarrh by reasoning back from the condition of the mucous membrane as he found it post-mortem, it was a purely arbitrary process, as Harke's results proved, for the brawny swelling which Zuckerkandl describes in chronic catarrh is also found frequently when the discharge is pure pus. (See Cases 18, 22, 23, 35, 42, 44, 70, 76, 77, etc.)

Finally, according to my observations, empyemata which present the signs of 'ozæna' are extraordinarily difficult of cure. The conditions which determine this I do not know.

The **indications for surgical interference** in empyema of the antrum appear to me to be as follows :

When a diseased tooth can be proved to be the cause of the suppuration, the tooth ought to be extracted, and the cavity opened through the socket. When the affection is recent, and no considerable disease of bone is present, it is sufficient to make a simple opening, through which irrigation may be practised, or powder introduced. But this line of treatment should never be continued for longer than two or three weeks.

Failure to cure in that time indicates the existence of deeper changes, which must be investigated. And thus we have the first indication for a free opening of the cavity.

The second indication consists in the presence of probable or demonstrable secondary changes of the kind described above.

In choosing a situation for a free opening, the requirements of treatment must be borne in mind. Now, as the chief objects aimed at by treatment are the permanent drying of the cavity, and the ability to deal radically with secondary changes, it will readily be understood that the deepest point is preferable, due regard being had to two points: (1) The use of the natural ostium as a counter-opening; (2) the treatment of the interior of the cavity through the artificial opening.

Bearing these points in mind, we have the choice of three situations.

The first is frequently almost forced upon one's attention by the natural conditions: it is the socket of a decayed tooth. If the latter already communicates with the cavity (through perforation or dehiscence), the existing opening must at once be used for purposes of treatment.

If there is no rupture, but if the bone of the upper jaw is soft and diseased, the cavity must be opened at this spot, as otherwise the diseased bone will injuriously affect the progress of the cure.

When the bone of the alveolar process is sound, one has a free choice between an alveolus and the anterior and inner walls of the cavity.

The possible entrance of infectious organisms from the mouth, which necessities the continual wearing of an obturator or other contrivance, must always be an objection to the alveolar opening. On this account the alveolar opening is to be rejected when one has a free choice, in spite of its obvious advantages for drainage.

The relative positions of alveolus and antrum require particular notice; otherwise, by going too far mesially, one may enter the lower meatus instead of the antral cavity.

Next we must consider the opening through the inner wall. (Zuckermandl's proposal to enlarge the natural ostium in the

middle meatus has been universally rejected, as it would not reach the deepest point.)

The opening through the inner wall from the lower meatus was performed by the English surgeon Gooch⁽²²⁹⁾, who died in 1780. Mikulicz⁽²³⁰⁾, as is well known, recently reintroduced the method, and Krause has strongly recommended it.

An objection to this opening is, that as a rule, it only gives room enough for irrigation or the insufflation of powder. A great advantage, on the other hand, is that it is better protected from infection than any other, being, in fact, under the same conditions as an accessory natural opening.

I took advantage of this in one case, in which I wished to withdraw secretion from an antrum the natural ostium of which was obliterated by adhesion. Desprès⁽²³¹⁾ records that Demarquay artificially closed a fistula between the antrum and the mouth. This caused, of course, retention of secretion and distension of the cavity (for the fistula could only exist to supply the want of a natural opening), and Demarquay was obliged to reopen the channel.

Another proceeding would, I think, be preferable, as in

CASE 142.

Empyema of the Antrum. Closure of the Natural Opening. Creation of a Permanent Fistula in the Lower Meatus.

The patient was a girl of 9 (see p. 8), who was suffering from purulent discharge from the right antrum and distension of its bony walls. I had perforated through the socket of a diseased tooth and irrigated, but this became gradually more and more difficult, and at last no water at all flowed away through the nose, and, no air being able to escape alongside of the tube, very soon no more water entered the cavity. Thus, the natural opening into the nose was blocked, and I think it very probable that this had happened once before, producing retention of secretion and swelling. It was obvious that if I enlarged the alveolar opening an obturator would have to be worn permanently, and permanent drainage be established, as in Demarquay's case.

I wished to avoid this latter objection, and make the artificial opening as like as possible to the natural one, but without its

disadvantage of being too high up. On this account I made the opening in the lower meatus at the spot chosen by Mikulicz. In doing so I became aware for the first time of the difficulty of maintaining a sufficiently large permanent opening at this spot. At first I made a hole with a pretty broad chisel, but in four days it was so grown up that it had to be reopened with the galvano-caustic burner. The next three months were spent in ceaseless efforts to keep it open, but at the end of that time it was incurably grown up.

At last, under an anæsthetic, I made a hole 1 cm. in length and 0.5 cm. in height, chiselling away the bone and removing the pieces. This stopped the tendency to rapid growing up, and the hole remained permanently open, though afterwards it became much smaller. Thus, the retention of pus was cured, and the distension of the bone subsided.

In the treatment of empyema I have only employed this method on two occasions, and I found it eminently unsatisfactory, for the opening is extremely troublesome to find. I have quite abandoned it as a method, and would only employ it if from external circumstances no better were available, as occurred in the two cases referred to.

The fact that the cavity may prove to be inaccessible by this route, as Heymann⁽²³²⁾ found, is an objection that might, upon occasion, apply to every other. But the route is used chiefly for exploratory puncture, and I, at least, have never experienced any difficulty in that direction.

The third way is through the anterior wall of the cavity, in the canine fossa under the anterior end of the zygomatic process.

Lamorier⁽²³³⁾ was the first to propose this route; he exposed the cavity above the third molar, through an opening large enough to admit the little finger. Later, Desault and Ziem again used the method, and most recently it was reserved for Küster⁽²³⁴⁾ to restore it to favour by combining with it the packing with iodoform gauze. At the time that his paper on the subject appeared, I had, without knowing anything of it, already treated two cases very successfully in the same way. I was impelled to this proceeding on the one hand by the uselessness of irrigation through a narrow opening, and on the other hand by the case already mentioned in which the antrum was opened by the kick of a horse. I saw that here was the

frest and widest possible opening. Whilst in this case and in Lamorier's the opening was over the second and third molar, I, and Küster also, have made it over the first molar and second bicuspid.

The priority in this rediscovery belongs undoubtedly to Küster, and my proceeding only differs from his in that I do not remove such a large piece of bone. Küster makes the opening so large that he can examine the interior of the cavity with his little finger, for he considers this necessary for the thorough removal of all disease. The disadvantage of this is 'that the patient sometimes retains all his life an open passage into the antrum,' which then requires to be closed by an obturator. I have not found such a large opening necessary; it is sufficient for me to expose the cavity so that I can examine it thoroughly (1) by feeling over the interior with a sharp spoon, (2) by inspecting the interior after the bleeding has stopped, (3) by scraping it out if need be.

A hole 8 to 10 mm. square is sufficient for this purpose. If not artificially held open, it gets rapidly smaller, and I have never had any trouble with food or drink finding its way in; and it always heals completely.

I operate as follows: One or two firm plugs of sterilized gauze or wadding are packed in posteriorly between the gum and the cheek, so as to soak up the blood. Cocain is used, or chloroform. A steel eyelid-holder is introduced into the angle of the mouth, and the upper lip is drawn up out of the way by an assistant. This causes the mucous membrane over the upper jaw to form a vertical fold between the second bicuspid and the first molar. This fold is divided by a horizontal incision down to the periosteum, the upper flap is drawn upwards with a double hook, and immediately a chisel (6 mm. broad) is driven vertically through the wall. Three more strokes with the chisel, each at right angles to the previous one, enable one to remove a complete square of bone from the anterior wall. A chisel cut off obliquely at the point has proved particularly useful (Plate II., Fig. 13).

A Volkmann's spoon of suitable size is next introduced, and first used as a probe to feel the condition of the interior; and then carious areas and granulations are scraped out. A spoon

set at an angle (Plate II., Fig. 6) will be required to thoroughly clear out the alveolar sinus when present, and a long strip of dermatol gauze, 2 cm. in width, should then be introduced and firmly packed in.

The long strip is cut off at the edge of the bone, and a little separate plug of gauze is pressed directly into the opening and tucked under the upper lip.

The scraping out of the antrum must be done with the greatest rapidity, for the hæmorrhage it causes is always very free, and sometimes excessively so. (Dermatol gauze is preferable to iodoform gauze, as the taste of the latter destroys the appetite.)

It may be asked whether a simpler proceeding, such as the puncture of the anterior or inner wall, should not be adopted in preference to a severe operation like the above, which is only possible under an anæsthetic, and which, in spite of every care, always causes considerable hæmorrhage. The answer is, Decidedly not. In selecting a method of operation, the chief thing to be considered must always be the amount of good it will do the patient, not the convenience or comfort of the proceeding in other respects. Now, it is one of the cardinal principles of specialism to avoid big operations as far as possible, by the discovery and development of ingenious methods by which the hidden cavities of the body may be made accessible without the infliction of large superficial wounds. That is certainly a praiseworthy aim, but it must not be carried to the point of giving up advantages which can only be obtained by a more extensive operation and the freer exposure of a cavity. I have taken up the same standpoint with regard to the treatment of certain laryngeal tumours, and severe cases of frontal empyema⁽⁴³⁾; and my own experience, and that of others, of the changes in the antrum in very chronic disease has only confirmed my opinion. Changes of the kind described above must be removed by direct operation, which is only feasible through a wide opening; otherwise suppuration is kept up, either permanently, or at the best, for a disproportionately long time.

When the opening of the cavity and the necessary clearing out of granulations, necroses, etc., has been completed, there

still remains the question of **after-treatment**. In the first place, the gauze plug should always be applied when a free opening is made, for its power in controlling hæmorrhage if for no other reason. I leave the plug in from one to three days, and then remove it and carefully inspect the cavity (now dry) by reflected light. Any diseased structures which may have been left can now be seen, and removed easily and certainly with the sharp spoon or the snare. When this has been done, the opening should still for a few days be protected against infection from the mouth by a little strip of gauze frequently changed, and irrigation should be begun at once.

In cases where it has been necessary to make a larger opening by Küster's method, so that one has reason to fear the establishment of a permanent communication with the mouth, I have successfully adopted the plan of putting a 'secondary' stitch through the lateral parts of the wound on the third or fourth day. For the rest, it is only when the plugging has been too long continued that there need be any fear of the cavity remaining open. In cases that heal quickly—that is to say, when the cavity remains dry after the plug is removed—a daily inspection must not be omitted till the opening is securely closed, after the cavity has remained dry for several days. This is necessary to guard against reinfection. For the same reason it is a good plan at this time not to plug the opening, not even with the shortest strip of gauze, but only to lay a little gauze or wadding between the gum and the upper lip, when the pressure of the latter will shut off the cavity completely.

In cases which do not heal so quickly, the most complete removal of secretion from the cavity must be provided for. Continuous drainage with rubber tubing such as Küster employs, has not been satisfactory in my hands, for the tubes soon become blocked with little clotted masses, and irritate both the inner wall of the cavity and the mucous membrane of the mouth. On this account I soon abandoned their use.

Unmixed good, on the other hand, is done by irrigation. The cavity can always be cleaned in this way. The remains of the liquid must be thoroughly blown out with a Politzer's bag. I have already remarked that any disinfectant action is

purely illusory. A protracted catarrh is a frequent sequel, best combated by washing out with saline solution, or by the application of astringents, such as alum or nitrate of silver, in weak solutions. Before employing either of the last-mentioned drugs, it is desirable to wash out the cavity, and dry it by blowing through with a Politzer's bag, for alum coagulates mucus, which prevents its action, and nitrate of silver is converted into chloride by any water except distilled. I have never seen the sense of smell injured, as is related by Walb⁽¹⁴³⁾.

The tube figured on Plate II., Fig. 12, with perforations all round, is indispensable for purposes of irrigation, washing out recesses in every direction at the same time. Further, during the irrigation the tube must not be held immovable, but moved gently out and in at various depths, so that every part of the walls may be reached. It must not be introduced too deeply, however; several times in my experience the point of the canula has passed through the ostium maxillare into the nose, so that the latter was cleaned instead of the antrum. The recognition of this fact lessened our astonishment at the obstinacy of the disease in question.

Prolonged experience of the treatment with disinfecting powders convinced me that it was practically useless, and I have in consequence quite given it up again, as well as the treatment with iodoform and ether.

For purposes of irrigation, to be used one to three times daily, I prescribe boiled water with the alkaline powder dissolved in it (see p. 166).

The very great majority of cases of empyema of the antrum heal under this treatment.

Nevertheless, cases have occurred to me, and, as I know, to other observers also, in which there seemed to be no tendency to the diminution of discharge.

Now although in such a case it is impossible to speak too strongly of the caution necessary to prevent one from overlooking other possible sources of pus, especially such as continually reinfect the antrum (I speak from repeated experience), yet there are, in fact, affections of the antrum which are absolutely intractable.

If this condition were accompanied with very severe symp-

toms (which I have only once observed), then, and only then, one would have to consider the operation proposed and performed by Jansen (⁶¹) for obliteration of the cavity by removal of the entire anterior wall.

(As a rule, in suppuration of the accessory sinuses the pain and discomfort yield when the cavity is simply opened, even if the healing be delayed.)

Only circumstances such as I have mentioned above, or very extensive destruction of bone, would justify a disfiguring operation like Jansen's; its frequent performance is forbidden by the fact that a majority of empyemata are cured, and permanently cured, by free opening, and a few even yield to simple puncture and irrigation.

(I have confirmed the permanency of the cures by examination from six months to three years after operation.)

In an obstinate case which was causing no particular pain or trouble, and in which the secretion was chiefly mucous, but undiminished in quantity, I would always prefer to operate a second time from the canine fossa, removing a larger piece of bone—say 1.5 cm. square—and, after carefully stopping all bleeding by plugging for two days, again carefully inspect the interior by direct illumination. I cannot divest myself of the idea—and my experience supports it—that in such troublesome cases the suppuration is often kept up by circumscribed morbid changes which have been insufficiently removed, and which one can easily discover and thoroughly remove at the second operation (see above, p. 23). Here, too, a 'secondary stitch' would have to be put in.

Rule-of-thumb methods are most of all to be deprecated in the treatment of chronic empyema of the antrum. The objects to be kept in view are always the same, viz., free drainage for pus, and the removal of those secondary changes which keep up the suppuration and interfere with the cure; but these objects are best attained sometimes by one means, sometimes by another, according to the relations of the particular case.

The advantages of one method or another can only be discussed in reference to a particular case; no proceeding in medicine can claim unconditional and universal applicability.

This much, however, is certain—with any method one may achieve failure.

The hands of feeble imitators have fulfilled the words of the poet, 'Vernunft wird Unsinn, Wohlthat Plage,'* and the very subject under discussion has furnished deplorable examples. Patients have been directed to apply the iodoform gauze plug themselves for years at a stretch, forcing in a strip of gauze 15 cm. long every day with much trouble. I have heard of this proceeding being continued for six months through a very small opening into an antrum whose natural ostium was obliterated by adhesions. I have known the use of a drainage-tube to be persisted in till a regular tube of granulation tissue had grown up round it in the interior of the cavity, so that in the recesses thus formed the most fœtid pus constantly accumulated; these are pertinent examples of what patients have suffered at the hands of the surgeon. But I do not mean to say that we rhinologists have been guiltless in the matter: *peccatur intra et extra nares*.

For the rest, one may say that any and every kind of treatment would be ineffectual if the causal or secondary changes outside the antrum did not at the same time receive attention. It is impossible to inquire too particularly into the condition of the teeth. I have seen apparently healthy teeth, in which the most careful dentist could find no disease, keep up the suppuration. At last the presence of slight morbid changes became evident, and the removal of these sufficed to cure at once a chronic fœtid discharge which had persisted in spite of the free opening of the cavity. Even disease limited to the crown of a tooth is sufficient, in my experience, to exert an irritant action upon adjoining parts; hence it is better once in a way to sacrifice an apparently healthy tooth than to further worry the patient (and one's self) to no purpose.

The complete freeing of the nasal ostium is absolutely essential, whether it be closed by tumour formation, turbinal swelling, or adhesion; this follows from the nature of the case. We have a cavity which naturally secretes, and which, after the cure of a suppuration, will be more easily inclined to secrete to excess than under normal conditions; in addition,

* Reason becomes unreason, benefit (becomes) calamity.

so long as a cavity with rigid walls retains its lumen, one cannot depend upon secretion escaping without a counter-opening.

Finally, the closest attention must be paid to the detection and removal of suppurative disease in neighbouring parts (ethmoid, frontal sinus) capable of infecting the antrum and keeping up suppuration in it.

Not one of these precautions is superfluous.

The results of treatment cannot be estimated off-hand in anything like a statistical form. This was to be expected from the multiform nature of the pathological changes—changes which have only recently been successfully explained *in vivo* by the method of after-inspection described above.

The estimation of success is particularly difficult in those cases which are complicated with suppuration in other cavities.

With regard to the duration of my cases, I cannot attempt to fix it, as Killian (³⁹) does, by the number of days, for I have often found it impossible in complicated cases to say when a particular cavity was healed. Speaking generally, I may say that my cases varied in duration from eight days to nine months.

I think I may dispense with a statistical table. There is more than enough of that sort of thing already in the literature, and what has been said above, with the remarks in the clinical histories of complicated cases, ought to be sufficient to show how unusually heterogeneous is the material with which one has to deal.

F. SUPPURATION IN THE ETHMOIDAL CELLS.

SUPPURATION in the ethmoidal cells demands a more detailed discussion of its origin and course, for, thanks chiefly to Woakes's (¹⁴⁶) descriptions, a mystical element has been imported into the pathology of these cavities, which has caused even the bare facts to be doubted.

My own experience, which is the outcome of many observations, both clinical and anatomical, teaches me that empyema of the ethmoidal cells, like that of all the other accessory cavities, is in the first place an affection of the mucous membrane, occurring either in an isolated form or affecting at the same time neighbouring cavities, and often, indeed, caused by such affection.

Increased secretion, as is well known, is present in all forms. If inflammatory swelling should close the natural openings of the cells, retention of secretion takes place. The consequences of such retention are very various.

In a slight or non-virulent infection the retained secretion does no more than gradually distend the cavity (as in cyst formation), producing a 'bone-cyst' of the nose. This description is purely semeiological, and I prefer to name the condition from its mode of origin and the contents of the cavity—a closed empyema.

Those cases of dilatation of the ethmoid labyrinth in which there is visible external swelling also belong to this category. Such a closed collection of secretion may establish communication with the external world by softening or bursting the adhesions about the natural openings of the cells, or by breaking through their bony walls. When this happens, an open

empyema is formed, which, if it rupture externally, becomes an orbital or facial abscess; if internally, a latent empyema. There is no doubt, however, that this latter condition arises in the great majority of cases primarily, from the continual discharge of the secretion of the inflamed lining membrane of the cells through the open normal ostia.

We must also be prepared to meet with combinations of these various processes, and we shall not be deceived in this expectation.

In suppuration of the ethmoid labyrinth I have seen, at the same time, cells which were discharging, and cells which were greatly dilated and reaching at parts to the septum to which they were adherent, so that the case sometimes presented the appearance of bony atresia of the choanæ, when looked at from behind.

It is well known that a closed collection of pus may powerfully influence the bony walls that confine it, thinning or corroding them.

This is not so likely to occur when the secretion has a free vent; but it must not be forgotten that the conditions in this respect vary in the most extraordinary way. Matter may have to-day an exit which did not exist yesterday, and may no longer exist to-morrow; and thus one may see the results of retention when the retention itself is no longer present. But, apart from this, disturbances of nutrition, due either to intensity of infection, or of a more gradual kind and conditioned by vascular changes, may bring about destructive processes which take the form of ulceration of the soft parts, or the bone, or even of complete necrosis. Well-established cases of this sort have already been mentioned (p. 30), and others will be found below.

In addition, partial or general outgrowths of the mucous membrane, sometimes of great size, are well known to occur. They constitute, in fact, the most frequent concomitant sign of empyema.

As regards the question where the bone disease begins, there is, as far as we know, no reason to suppose that it begins elsewhere than on the surface. There is no evidence of a primary disease of the bone such as Woakes assumes. Even

when it apparently begins centrally, the nutrient vessels have been obliterated by the superficial process. The secondary nature of the erosion of the bone surrounding the cells themselves is evident from the preparation taken from Case 10 and described on page 29 (Plate I., Fig. 1).

Finally, it is certain that every kind of suppuration in the ethmoid may run its course without any destruction either of soft parts or bone; and although we have seen from the preceding pages that the various forms of ethmoidal empyema may run into one another, and therefore cannot always be sharply differentiated, yet the clinical importance of the form it assumes for the time being, renders it advisable to keep to the following classification:

I. Closed Ethmoidal Empyema

consists in an accumulation of pus inside one or more cells not communicating with the outer world. It is not improbable that it frequently depends upon cyst formation (as in the case of closed empyema of the antrum, where it leads to dilatation of the walls). This appears still more likely when one considers that in the majority of cases of bladder-like dilatation of the ethmoidal cells accumulations of mucus have been found, which might perhaps eventually have undergone conversion into pus. Such cases were formerly described as empyema, even when no pus was present.

The following two cases are probably the first in which the presence of pure pus in a closed cavity in the ethmoid was definitely ascertained:

CASES 143 AND 144.

A woman of 45 consulted me on account of left nasal obstruction of several years' duration. The nostril was almost completely blocked in its deeper part by a grayish-white rounded swelling as big as a hazel-nut, with somewhat uneven surface and dullish lustre. It was situated on the middle turbinal, and could be felt to be of a very hard consistence under the softened mucosa which covered the surface. It was removed with the galvano-caustic snare. Immediately afterwards a large quantity—about half a cupful—of excessively foetid gray pus was evacuated. The microscopic examination revealed only granular detritus and bacteria. The cavity

from which the pus escaped was the most anterior ethmoidal cell, greatly dilated. Discharge ceased, and the case healed without any further treatment. The cure was permanent.

The second case concerned a lady of 37, and has already been mentioned under 'ozæna.' The (otherwise atrophic) nostril was blocked by a globular expansion of the middle turbinal, pale-red in colour, slightly granular on the surface, and hard in consistence. After removing the thickened hypertrophic mucous membrane from the surface, it was found that the tumour consisted of bone. On drilling a hole, I obtained access to a closed cavity full of fœtid pus. This proved to be the dilated ethmoid labyrinth. A similar swelling on the right side had already been partially opened by ulceration on its septal aspect. It was afterwards freely evacuated.

The cases formerly described in the literature as bone-cysts and empyemata of the middle turbinal are identical with the above in appearance, but not as regards the nature of the contents of the cavity. This was either empty—as in Glasmacher's⁽²³⁵⁾, Schäffer's⁽⁸¹⁾, and Zuckerkandl's⁽²³⁶⁾ cases—or contained only mucus; hence, mucocele would be the proper designation, not empyema.

Schäffer⁽²³⁷⁾ has lately reported bone-cysts full of pus, so confirming my observations. Mackenzie⁽²³⁸⁾ mentions two cases of mucus accumulations in the ethmoidal cells. The preparations are preserved in the museum of St. Thomas's Hospital, and Mackenzie was inclined to think that during life the appearances presented would have simulated mucous polypus. (Berger and Tyrman⁽¹⁶¹⁾ and Zuckerkandl misquote this case.)

Other examples have been described by Hulke, Braynard, Emetzky, Langenbeck, and will be found recorded at length in Berger and Tyrman.

(Another case⁽⁷³⁾ of Vicentiis, also mentioned there, is fully reported by Baasner.) Two other cases from the same source by Schech and Knapp cannot be identified with certainty; apparently they were orbital cysts. Beyers⁽²³⁹⁾ and Greville MacDonald's⁽⁴²⁾ cases also belong to this category.

The literature of bone-cysts has been much increased of late, but there is nothing new in it. MacDonald refers the origin of this appearance (observed by him in four cases) to an osteophytic perichondritis (?), by which the free edge of the middle

turbinal, growing round, becomes attached to the concavity of the body of the bone, thus enclosing a cavity in which secretion accumulates—an explanation which proves the author to possess a fertile imagination.

Finally, Schech⁽⁸⁴⁾ has published a case in which 'mucopurulent fluid' was found in a large dilated cavity in the middle turbinal, apparently a transition stage between mucocele and empyema.

As the former disease (of which I have observed several examples) does not, strictly speaking, belong to our subject, I must refrain from further discussion of it.

The treatment of closed empyema is very simple, as is evident from what has been said. Free opening with the galvano-caustic burner or the conchotome, or, in the case of a prominent swelling, removal with the hot or cold snare, suffices to bring about a rapid cure.

II. Open Ethmoidal Empyema,

or, if preferred, suppuration in the ethmoidal cells communicating with the outer world (although the name empyema, since its application to the antrum, may fairly be applied to half-open cavities). This is much more frequently observed than the closed ethmoidal empyema, although it is often enough overlooked.

Till a few years ago, all the ethmoidal diseases that one knew of were those found on the post-mortem table, and those which, by rupturing externally, as (*a*) **evident empyema**, so forced themselves upon one's attention that it was impossible to overlook them.

The oldest observation we have on this subject is Sonnenburg's⁽²⁴⁰⁾, published in 1877. It reported two cases of acute orbital phlegmon. (As the material is so scanty, acute suppuration of the ethmoid may also be included here.) Sonnenburg thought the orbital phlegmon was due to primary disease in the nose. In both cases a hard board-like infiltration of the intra-orbital tissue developed in the course of a few days; and, in the second case, deep incisions were made into this infiltration, some pus was evacuated, and on the following morning a small quantity of foetid pus came from the nose.

Unfortunately, no more minute examination was made, but Sonnenburg's view of the origin of the disease was probably correct.

Next in order come Schäfer and Hartmann's cases, already referred to (see pp. 141 and 29). Here also rupture took place in the direction of the orbit, just as in the next case—Vermeyne's (241), probably identical with the one misquoted by Berger and Tyrman as 'Vernujne,' pp. 12 and 14—in which a 'retranasal process' led to a bulging at the inner angle of the orbit, which had to be incised. The 'retranasal process' referred to was probably a sphenoidal empyema.

Bull (16) and Jeaffreson's (6) cases of empyema ran a similar course.

Bull observed an abscess burst in the inner angle of the right orbit; the eyeball had previously been displaced downwards and outwards, and there had been dull aching pains for over a year. The abscess cavity communicated with the right side of the nose, and was lined with osteophytes. Discharge, and the lotion used in irrigation, escaped through the nose. The case was cured in four months.

Jeaffreson reports three similar cases, of which two occurred after scarlet fever.

In the first case there was exophthalmos (left-sided), displacement of the eyeball outwards, and chemosis. An incision was made on the inner side of the eyeball without success; but the finger introduced into the incision felt the inner wall of the orbit to be thinned, and crepitating under pressure. An incision through the bone in this situation evacuated very foetid pus. Cure was rapid.

The second case set in suddenly during convalescence with rigors, fever, headache, and other cerebral symptoms. A few days later there was right exophthalmos with amaurosis and double optic neuritis. A deep incision on the inner side of the right eye evacuated pus, and more pus oozed out on pressing the left eye. Thereupon an incision was made on the left side also, and a communication between the abscesses was made out. Twenty-four hours later all threatening symptoms had disappeared and sight had returned. Healing was not complete for ten months.

The third case was that of a lady who was seized (after catching cold?) with pain in the right eye and exophthalmos. An incision in the upper part of the orbit under the lid reached

pus, and extensive necrosis was found in the posterior and upper part of the orbit. After some time the acute symptoms recurred; they were found to be due to a fresh frontal empyema, and it became necessary to open the frontal sinus and remove the eyeball. During the succeeding four years pieces of necrosed bone separated from the orbit, and the process was not yet finished at the time of last report.

A chronic traumatic empyema reported by Baasner⁽⁷³⁾ may also be mentioned in this place (see above, p. 144).

Thudichum⁽²⁴²⁾ in one of his lectures mentions that he had seen several severe cases of ethmoidal abscess which burst either into the nose or into the orbit (on the upper eyelid or below the internal canthus).

Unfortunately, no details are given, so that one can say nothing more about them. No doubt the cases were similar to those just described.

It is certain that in many cases it will be impossible to make out any essential difference between mucocele, closed latent empyema, and open empyema with rupture, internally or externally, inasmuch as each of these forms may correspond to one particular stage of a single progressive process.

On the other hand, many inflammations of the ethmoidal cells will be found to conform during their whole course to one of the described forms, so that the above classification seems to be justified, taken in connection with the distinguishing and prognostically important symptoms peculiar to each stage and form of the inflammation.

I have already mentioned that a mucocele may turn into a closed abscess; in the same way it is evident from the preceding descriptions of cases that an empyema which has already burst internally (but incompletely) may still point externally; whilst in other cases the external rupture is the first to take place.

The particular form of the inflammation is of importance from a therapeutic standpoint.

In this connection it seems fair to conclude, from the cases already described, that when the eye is dislocated outwards and downwards by a swelling at the inner angle of the orbit (whether above or below), there is probably an abscess or

tumour in the ethmoid, and that further diagnostic and therapeutic efforts must be guided in that direction.

I would fain hope that in the future it may be possible more frequently than it has been in the past, to evacuate pus freely through the nose without resorting to an external operation. In disease of the so-called orbital cells of the ethmoid bone, one can operate very comfortably; for perforation of the orbital plate, even if unintentional (supposing, of course, that it has not already taken place), cannot be considered dangerous. For my own part, I have several times been obliged to undertake extensive scraping out in this region, and have never experienced any unpleasant accidents; and in one case, in which the eyeball could be moved from below with the finger, there was never even irritation of the conjunctiva during the whole course of the case, which ended fatally; and this was true also of the case mentioned on p. 135, in which there was erosion of the lamina papyracea proceeding from disease of the antrum.

(Much greater caution is necessary in dealing with the lamina cribrosa, which, indeed, must be considered a *noli me tangere* unless there be a perfectly free view of the field of operation.)

When, however, it is not possible to obtain sufficient drainage through the nose, and when efforts in this direction fail, there remains only the external route, which is marked out for us in the reverse direction by the track of those ethmoidal abscesses which rupture spontaneously on the external surface of the body.

Long before Rosenberger's time, Riberi⁽¹⁰⁹⁾, in 1838, having observed that orbital abscesses frequently open through the ethmoid into the nose, adopted the same route by draining into the nose an abscess of the frontal sinus which had ruptured into the orbit. This he did by chiselling a hole in the lamina papyracea. At the same time, he recommended this operation in all cases of primary orbital abscess. Most surgeons, I think, will agree with the ophthalmologists in rejecting this proceeding as a general rule, for, in the first place, orbital abscess is very rarely primary, and even when it is so the infection of the healthy ethmoid is by no means a matter of indifference.

It is otherwise with the opening of primary ethmoidal abscess

threatening to burst into the orbit, in which case communication must be established between the two cavities.

In many cases, a simple incision at the point of greatest bulging is all that is indicated, but one cannot always wait till the abscess is 'pointing'; the pus ought to be found while it is still at a greater depth from the surface.

It is true that Riberi and Rosenberg's operations attained the object, but they were undertaken in cases in which the route was already marked out by a ruptured abscess. I thought it would be useful to devise a typical operation for cases in which rupture is to be expected, but has not yet taken place, and in which the nasal route is no longer possible.

I was led to do this by a case of empyema involving the frontal sinus and the frontal cells of the ethmoid, in which rupture of the latter seemed imminent. Although the danger was avoided in that case, and although I have always hitherto in my practice been able to manage with intranasal treatment of the ethmoid bone, yet I will describe the result of my investigations on the cadaver (the material for which I owe to the kindness of Professor Rüdinger).

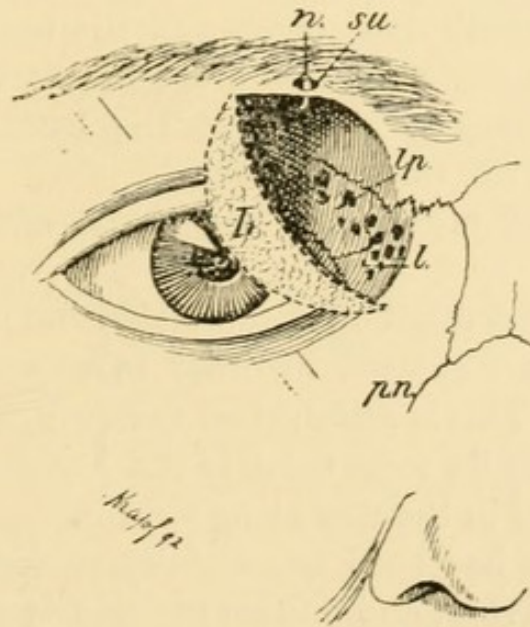


FIG. 5.

The operation would be performed as follows: A curved incision is made from the middle of the eyebrow to the inner angle of the orbit, running at first immediately below the eyebrow and parallel to it, then bending downwards by the root

of the nose and extending about half-way down the nasal bone—*i.e.*, just above and internal to the inner canthus (Fig. 5).

The incision divides at once skin and periosteum, and the vertical part of it is situated exactly at the spot where the orbital wall turns downwards to the nose.

The supra-orbital nerve (*n*), which inside the orbit runs under the periosteum, must be looked for and avoided when that structure is divided. It may be necessary to hold the nerve on one side, and this is done by dividing carefully on both sides the bridge of the foramen (*su*) and separating the periosteum, when the nerve is readily accessible.

The whole flap, including periosteum, is separated with an elevator and turned downwards. As only cutaneous vessels are divided by the incision, there is practically no bleeding, and one obtains a good view of a large part of the inner wall of the orbit (*l.p.*, lamina papyracea; *L*, the flap turned down).

The lachrymal bone (*l*) is the most accessible, and by dividing it with a chisel in a direction inwards, downwards, and backwards, the ethmoid labyrinth is exposed.

In the figure the ascending (nasal) process of the upper jaw (*p.n.*), the suture between this and the nasal bone, and also the sutures between both these bones and the nasal process of the frontal bone, are represented in order to show the relations of the parts, and also to show that the frontal sinus can be reached through the same incision.

The lachrymal organs are not at all endangered by the operation.

Kuhnt (⁷⁷) pointed out that the lachrymal sac and Horner's muscle must be displaced in order to expose the lachrymal bone so freely. This is self-evident from my description, seeing that these organs lie superficial to the periosteum, and are, of course, contained in the flap along with it.

The operation has been successfully performed by Winckler (²⁴³) on the living, and Jansen (⁶¹) also has made use of it several times in connection with opening the frontal sinus.

(*b*) **Latent Ethmoidal Suppuration.**—The diagnosis of this form is often just as difficult as that of the evident empyema is easy. Latent ethmoidal empyema includes all collections of pus in the ethmoidal cells which discharge only through the nose.

Acute latent suppuration has hitherto hardly been observed. No doubt one has sometimes to do with this condition in the acute suppurations of the meatus as I have described them above; but one rarely succeeds in proving the actual localization, and therefore I give here two well-established examples:

CASE 145.

Acute Suppuration proceeding from one Ethmoidal Cell in the Middle Meatus.

M. H., aged 46, has suffered for eight days from a profuse watery discharge from the nose; no other discomfort. On both sides the mucosa is very red, and slightly swollen. No secretion.

Examined four weeks later. The secretion is now said to be profuse and entirely purulent; for the last few days he has had severe pains in the left side of the forehead. Pus is visible on the anterior part of the left middle turbinal. Washing out the meatus removed the headache temporarily on two successive days.

On the third day the swelling had subsided somewhat; one could distinctly see the pus proceeding from the very back of the middle meatus, and the probe could be easily passed upwards and outwards into a smooth-walled cavity as big as a hazel-nut, from which the pus flowed by the side of the probe. From this time the headache disappeared permanently, but suppuration continued for several weeks, and required for its final cure the removal of a part of the middle turbinal.

CASE 146.

Acute Suppuration of one Ethmoidal Cell in the Middle Meatus.

H. S., aged 31, has had severe pain in the left side of the forehead for the last two days. At the very back of the middle meatus, which is freely exposed (owing to the removal of part of the middle turbinal two years before, in order to free the obliterated ostium maxillare), pus can be seen to well out from below a thickened fold of mucous membrane. On raising this with the probe, one sees directly into a cell full of pus. The walls are bare and smooth. Direct irrigation removed all symptoms in three days.

Of **chronic latent empyema** numerous examples have been observed; it is of interest to record some of the older

ones. In the first place, such cases may arise from the breaking through of pus retained in a bone-cyst, *i.e.*, the rupture of a closed empyema. This occurred in two cases recorded by Schmithuisen (²⁴⁴).

In both cases there had been foetid nasal discharge for eight or ten years, with polypoid degeneration of the anterior and lower part of the middle turbinal. Only after the removal of these hypertrophies did the greatly-enlarged middle turbinal become accessible, as it entirely filled the upper part of the nose and displaced the lower turbinal. Pressure on the tense swelling caused foetid yellow pus to ooze out of an opening in the upper and anterior part of the turbinal. A free opening cured it in three or four weeks.

Schäffer has several times observed such swelling of a turbinal in empyema, and I also have been able to demonstrate the existence of similar conditions in some of my cases, especially in the one next following (Case 147).

Ziem (²⁴⁵) had previously observed a case of ethmoidal suppuration, and tried in vain to cure it with injections of 3 per cent. carbolic acid, so that Schmithuisen's report really represented the second record of latent ethmoidal empyema. Several others followed quickly, for in the same year in which this first publication appeared (1885) four more authors published communications on suppuration in the ethmoid. Some of them were certainly very obscure, as was to be expected at a time when the significance of these facts was so little appreciated that some of the early observations were received with the utmost scepticism, or even ridiculed.

In connection with Schmithuisen's communication, at the same sitting Jacoby (²⁴⁶) remarked that he had observed a large number of cases of suppuration in which the pus came from the cleft between the middle turbinal and the lateral wall, and in which there was yet no sign of disease of the antrum or frontal sinus, where he supposed he ought to look for the source of the pus. The neighbourhood of the suppurating areas was covered with granulations.

Jacoby never thought of referring these suppurations to any other cavities than those mentioned, least of all to the ethmoid, although we, in the light of our present experience, see that his description points unmistakably to the ethmoid.

Just before Jacoby, in the January of the same year (strictly speaking in December, 1884) Thudichum (²⁴²), in the lecture referred to, described diseases of the ethmoidal cells, and enumerated as symptoms—pain between the eyes, loss of smell, rhinorrhœa, swelling of the glabella, and swelling and discoloration of the eyelids on one or both sides.

Unfortunately, he furnished no statistical proofs—so essential in such a new subject—and so it came about that his papers were declined by reviewers (Semon) as ‘very peculiar,’ and otherwise were entirely overlooked.

Woakes’s (¹⁴⁶) relation of his experiences of about eighty cases of ‘necrosing ethmoiditis’ suffered the same fate. Stated with dogmatic brevity, without detailed evidence, and dispensing with proof, they were twice declined by the publishers’ readers—once after the first communication in 1885, and again after a more detailed (²⁴⁷) communication in 1887.

Yet his observations contained many truths, in spite of the scanty nature of his reports.

He observed a slow, dragging inflammation in that part of the ethmoid which projects into the nose, occurring as a consequence of catarrh, the acute exanthemata, and injury, and leading to periostitis and necrosis. The disease was always progressive, and never healed spontaneously. It first became apparent by the formation of growths on the middle turbinal, which then enlarged. Later, polypi or rapid-growing myxomatous tumours developed, and led to necrosis of the thin bony laminæ. Neighbouring cavities, too, like the antrum, became infected.

Unfortunately, Woakes did not make it sufficiently clear whether these appearances had all been distinguished from syphilis, but in most of his cases, at all events, it does not seem to have been present.

After all, I find it impossible to recognise this process as typical. It is, perhaps, conceivable that once in a way an inflammation of the ethmoid bone and its periosteum may begin in the deeper parts and spread towards the surface, but it is most certainly not the rule, and that such a process should steadily progress is still less in accordance with my experience, according to which the extent of the destruction of parts in ethmoidal empyema often remains the same for years.

It seems to have been chiefly this tendency to systematize which led to the rejection of Woakes's views, for it is quite true that a picture of a disease such as he constructed for himself would not be easily recognised by others, whilst on the other hand certain of the symptoms which he described, such as the enlargement and distortion of the middle turbinal, the outgrowth of its mucous membrane, which finally leads to polypus formation, etc., can be constantly verified.

More fortunate than Woakes was Schäffer ⁽⁸¹⁾, to whose publications we really owe the more general recognition of suppurative processes in the ethmoid. Inasmuch as he did not deal in theories, but simply wrote short clinical histories, he furnished evidence which no criticism nor any theoretical considerations could dispose of, and which, although it did not supply a complete picture of a disease, yet made it possible by-and-by to construct such a picture.

Schäffer ⁽²⁴⁸⁾ afterwards busied himself in the latter direction, and attempted for the first time to present a typical group of symptoms as associated with ethmoidal empyema.

In 1885 he published four cases—clinical histories—of ethmoidal empyema: Cases 6, 7, 31 and 32 ⁽⁸¹⁾. In three of these there were polypi and also necroses of bone. In two cases the empyema was latent, and had probably, as in Schmithuisen's observations, originated from a closed empyema, for the middle turbinals were described as swollen and full of foetid pus (Case 7). These communications, although extremely laconic, had at least the merit of showing the curability of a disease which up to that time it had hardly been possible to diagnose, to say nothing of treatment.

In the following year Moldenhauer ⁽⁸³⁾ published his work on 'Diseases of the Bony Framework of the Nose,' of which he had seen six examples, and which in part, at least, seem to be identical with that which we now call empyema of the ethmoidal cells, although they might also be cases of caries of the ethmoid. This communication is specially remarkable on account of the exact observation of symptoms, which correspond exactly to my own experience, and could not possibly be better described.

In 1888 Schmiegelow ⁽²⁴⁹⁾ mentioned a case of empyema of

the ethmoidal cells observed by him, in a paper, 'Ueber den purulenten Nasenausfluss,' etc.

A pause of two years succeeded, till Schäffer (²⁴⁸) in a fresh paper published a series of eighteen new observations. These, too, are briefly, too briefly, reported, yet they contain much useful material. I would mention particularly the complication with polypi in three cases, in two of which there was necrosis; further, in several cases the occurrence of swellings (dilatations), cysts and bone-cysts of the middle turbinal; also co-existent habitual erysipelas, erysipeloid affections, and œdema; and especially the extreme painfulness of the affection.

It seemed at this time as if Schäffer alone were privileged to observe and to cure ethmoidal suppuration, for as in the preceding years so in those that followed, communications on the subject were few and far between.

Jurasz (¹⁴¹), according to his clinical report, could only discover one case; in that one there was a cavity containing pus in the bone of the middle turbinal, and the case was cured by a free opening and the application of 5 per cent. carbolic acid.

Greville MacDonald (⁴²) observed only one case of purulent collection in the middle turbinal, which (and this is the point of special interest) burst into the antrum, infecting that cavity. The abscess cavity was lined with granulations.

Bosworth (⁶⁶) was the next who was able to supply a more considerable contribution—thirteen cases of 'purulent ethmoiditis.' It is very remarkable that in all the thirteen polypi were present, and in seven cases a combination with empyema of the antrum was definitely made out. Bosworth drew from these facts the remarkable conclusion that the polypi were the cause of both diseases; but the most that the facts justified was the rejection of Woakes's view that polypi were always and only due to 'necrosing ethmoiditis.'

I have already sufficiently discussed the relation of polypi to empyemata (p. 99, *et seq.*), and so need not go further into Bosworth's views.

Bosworth recognises two forms of ethmoidal disease in addition to 'purulent ethmoiditis,' namely, extra-cellular and intra-cellular myxomatous degeneration. Apparently he refers to that polypoid degeneration of the mucous membrane of the

middle turbinal, and the internal mucous membrane of the ethmoidal cells, which frequently occurs in suppurations and catarrhs of this region, and leads eventually to the formation of pedunculated polypi. But it is not obvious from his report whether he regards this degeneration as an independent process originating of itself. If this should be the case, it drops out of our subject, as we are here only concerned with suppurations.

Of late statistical material has accumulated, but nothing essentially new has been adduced.

The large number of my own observations justifies me in relying chiefly upon personal experience in the following account of symptoms and treatment. The ætiology of ethmoidal empyema need not be specially discussed, seeing that the subject has been sufficiently treated in my general remarks on ætiology (p. 3, etc.); but I may add a few remarks.

It seems to be specially true of the ethmoidal cells that acute catarrh is credited with being the primary cause of suppuration. The real cause, however, is probably a primary streptococcus or staphylococcus invasion, the first attack assuming the guise of a cold in the head. There is copious serous secretion with swelling, malaise, headache, and fever. The external and visible signs have already been mostly described (p. 42). Special to the cavities in question is the following: The secretion is generally liquid, and consists of pus, pure, or with some admixture of mucus; in quantity it is extremely variable. Sometimes one can hardly get enough secretion for purposes of examination; and on the other hand I have seen patients who used as many as ten handkerchiefs a day, and whose pillows at night were soaked with the discharge of pus.

Comparatively often the discharge flows into the throat and dries there, and this is especially the case as it diminishes in quantity. From this cause arise dry catarrhs of the throat and larynx; in the latter the mucous membrane becomes completely macerated from the frequent contact with decomposing substances. In two cases such firm crusts formed in the larynx during the night, composed of secretion which had come down from above, that attacks of dyspnœa (described by the

patient as asthma) appeared. (Apropos of this, one ought not to be too ready to assume a reflex neurosis.)

The secretion is rarely foetid, but subjective disturbances of smell are very frequent, as might be expected from the nearness of the olfactory membrane.

Pains are frequently complained of; often the patients consult us for nothing else. The grinding headache described above is particularly common in ethmoidal empyema. Generally the pain is worse in cases with scanty secretion, and this may be due to the fact, that when there has only been slight destruction of parts it is more difficult for the secretion to get away, whereas an advanced process has generally caused such extensive loss of substance that the secretion, although more copious, drains freely away. I have, however, also observed cases in which from the very first there was an absence of pain, so that, quite apart from temporary or more permanent retention of secretion, individual differences in anatomical structure have a determining influence.

The pains, or, in milder cases, the feeling of tension or pressure, are chiefly localized about the root of the nose or over the eyebrows—that is to say, in the region of the frontal sinus. Tenderness on pressure is also present, especially at the supra-orbital foramen, exactly as in frontal empyema.

As distinguishing it from frontal empyema, I would direct attention to a fact I have not as yet seen mentioned. Pain on pressing the uppermost part of the nose, and especially the lachrymal bone, is a sign that is almost exclusively met with in ethmoidal inflammation. Asthenopia, as previously described, is particularly frequent in ethmoidal empyema; and the same is true of other subjective troubles. Speaking generally, it may perhaps be said that suppuration of the ethmoidal cells is more apt to cause subjective symptoms, than a similar affection of any other of the accessory cavities. Mental depression, general malaise, incapacity for and dislike of work, may also be mentioned. Almost the only external sign I have been able to verify is irritation of the conjunctiva, and in very tender subjects some swelling of the nose and eyelids.

I have not observed swelling of the bones at the root of the nose with redness and swelling of the soft parts, as Schäffer

describes them. Perhaps these signs belong more to the period of threatening rupture.

The rhinoscopic appearances vary greatly. Sometimes there is so much pus present that it is impossible to make out where it comes from, fresh matter welling out continuously as fast as it is wiped away. In such cases, too, the overgrowth of the mucosa is generally so extensive, either in the form of polypi or the flatter œdematous degeneration, that one cannot (to use a nautical phrase) get one's bearings. If, then, sufficient of these growths be removed to re-establish nasal respiration, very extensive destructive changes generally come to light: the middle spongy bone distended with cysts, rotten to the feel, giving way under slight pressure, with creamy or blood-stained pus welling out of it everywhere, as from a sponge. In one place one sees deep recesses in the bone, from which, perhaps, larger or smaller polypi bulge out unsuspected; in another place firm cushions of the soft tissues shut off the view. Finally, when one has cleared away diseased parts, and made room wherever pus showed a tendency to gather, one sees, perhaps, into wide cavities; but more frequently these are hidden from view by the configuration of the turbinals, and are only accessible to touch, *i.e.*, to the probe.

In other cases in which there is less secretion, one sees the middle turbinal covered with a thin layer of pus, or it may be quite free from it, the mucous membrane finely or coarsely granular, with a dull lustre, from pale red to grayish-white in colour and very spongy; or one sees, as in polypus cases, these swellings crowding forward between the middle and lower turbinals, sometimes smooth, sometimes more resembling degenerated mucous membrane, in consequence of superficial granulation. Between the growths there may be a little pus, or it may ooze slowly out when one lifts them with the probe.

For the rest, one must be careful not to confound the mucopurulent contents of cysts contained in polypi (as they sometimes come away after snaring) with the secretion from the ethmoidal cells. The latter always re-forms.

On examining with the probe, one can penetrate into smaller or larger cavities, whose purulent contents can be seen to ooze out along the instrument. Such cavities generally lie external

to, and above, the middle spongy bone. But they may also extend into the substance of the bone, distending it, so that one finds cavities inside the turbinal or perforating it.

If the cavities become very large, they give rise to the so-called bone-cyst tumours. Such dilated cells may be broken through by the pus, or their natural openings so dilated in process of growth that a cleavage of the middle turbinal occurs, so that it is apparently duplicated. Woakes has already described this appearance, and I can only confirm the accuracy of his observation.

One must guard against confounding this cleavage with that more frequent form of apparent duplicature of the middle turbinal first described by Hartmann, and produced by hypertrophy of the lower lip of the hiatus. The direction of the cleft in this latter case is upwards and outwards, whilst the true cleft in the turbinal runs directly backwards. Again, one cannot penetrate so deeply into the true cleft as into the false one, seeing that the latter leads into the hiatus semilunaris.

In probing, one may erroneously suppose that the instrument is in the middle cells, which, as is well known, are situated outwards and upwards from the middle turbinal, when in reality it is only lying between the middle turbinal and the external wall of the middle meatus; and this is especially apt to be the case if inflammatory growths or bone disease have developed in this space.

From the latter position the probe glides smoothly downwards over the lower turbinal, whereas, when correctly placed inside the ethmoidal cells, their lower walls oppose a solid resistance to any downward movement.

It certainly happens sometimes, and is occasionally observed, that cells in the position described, by destruction of their walls, become confluent with other cells or with the middle meatus. This can only happen, however, where considerable destructive changes have taken place, and a possible error will the more easily be corrected by direct inspection, after the removal of diseased parts. But in any case one must decide *in dubiis pro minore*.

When one 'enjoys' such a view as is described above, it will not be difficult to get on the track of ethmoidal suppuration.

Nevertheless, it often remains undiagnosed, even when the appearances are very striking. Such an error is inexcusable, but, on the other hand, in many cases the suppuration is so concealed that it is only found with the greatest trouble.

Suspecting an empyema from the patients' account of the symptoms or from one's own experience, one looks into the nose, and is very much surprised to see a perfectly normal picture. The turbinals lie peacefully in position, or at the most there may be a little inequality noticeable at the anterior end of the middle turbinal, or the erectile tissue of the lower turbinal is perhaps somewhat engorged. It is such cases which entirely escape the observation of anyone who does not systematically use the probe.

It is a fault of our diagnostic methods which cannot be too strongly insisted upon, that we do not use the probe sufficiently. I have treated a colleague who had previously been through the hands of four highly-esteemed specialists. During thirteen years he had been repeatedly cauterized, had been 'freed' from innumerable polypi, which continually recurred, but never on any occasion by any of the four had the probe been used. With the help of this simple instrument I detected extensive empyemata involving both ethmoidal labyrinths and the sphenoidal sinuses, all of which were treated and cured.

This was no solitary instance; it has been a frequent experience with me. Without the probe a negative diagnosis can never be established; with it, on the contrary, one can explore the most hidden corners. The value of the probe can only be rightly estimated by one who uses it constantly.

In such cases as the one just described one must introduce the probe on both sides of the middle turbinal, for pus appears almost as often on its mesial as on its lateral aspect. Not rarely one will see pus between the septum and the middle turbinal, and on probing the part find a carious area. It is more frequent, however, to find the disease between the middle turbinal and the outer wall. On pressing the probe through this narrow chink, one frequently feels the point slip into a cavity, often fairly large, with smooth or rough walls, the presence of which could not have been suspected from the rhinoscopic appearances.

Occasionally it is necessary to bend the point of the probe at an obtuse angle, in order to penetrate concealed cavities, which are often situated laterally and are not otherwise accessible. Finally, I must admit that sometimes even the probe leaves one in the lurch. One feels, perhaps, a momentary roughness at the moment when the probe passes through the narrow fissure, whilst further in all appears to be smooth. This is due to the fact that the carious areas are covered over by soft granulation tissue. By introducing a slender sharp spoon (Plate II., Fig. 5), and using it as a probe, one soon finds out how the land lies, for the sharp edges of the spoon catch everywhere against the slightest inequality, over which the smooth probe would glide. See also Schuster⁽¹⁴²⁾.

The results of probing are chiefly significant in guiding one to the seat of suppuration. It must never be forgotten that caries and granulations, when they do occur, are only secondary effects, and may be absent without prejudice to the existence of empyema.

With regard to the localization of the pus, it has been maintained that when it comes from the anterior ethmoidal cells it appears between the middle and lower turbinals, and when from the posterior ethmoidal cells, between the middle turbinal and the septum. Reasoned out theoretically on a prepared skull this is quite correct, but it does not correspond with the facts of experience.

A probe introduced on the outer side of the middle turbinal may penetrate the most posterior of the ethmoidal cells, a result I have frequently observed. One must remember that pus does not always escape through the natural openings, which in the case of the ethmoidal cells are often very unfavourably placed for drainage, but chooses the nearest way, making new paths for itself.

Even the anterior ethmoidal cells occasionally empty themselves towards the septum. Thus, the position of the pus justifies very few conclusions as to its source.

Pus in the middle meatus may come from the frontal sinus, the ethmoid, or the antrum, whilst pus on the roof of the nose points more to the orbital or frontal cells.

However, no long deliberations are necessary. Wherever

one sees pus, one seeks with the probe for the source of it, and lays it freely open by operative means. It is a matter of indifference, alike as regards the patient and the empyema, whether it is situated in the anterior or the posterior ethmoidal cells; the disease can only be removed by seeking out the focus, whatever it may be called, and destroying it.

One point more regarding the use of the probe deserves special attention, and that is the painfulness of it. When there are very extensive destructive changes, which are, of course, more easily recognised, the probing is only slightly or not at all painful, but it is otherwise when there is disease of isolated cavities, narrow or difficult of access; then the lightest touch on the carious parts is very painful, and every time the same pain is felt at the same spot at which it otherwise appears spontaneously. Just as regularly pain disappears when cure has begun, and this provides us with a valuable indication as to the condition of the process, even when the bone is not yet covered over.

Here as elsewhere, however, the demonstration of pus on the spot, in the cavity, is alone decisive for the diagnosis. One must either be able to observe it directly, *in situ*, or one must see it running down the probe, or be able to blow it out through a canula which has been introduced. Other signs may be important, but they concern secondary changes; an empyema remains an empyema, even when it has not led to caries, etc.

Robertson (²⁵⁰) has recently recommended transillumination as an aid to diagnosis. Normally, he says, a bright band is visible on each side of the middle line of the cartilaginous part of the nose. When empyema is present, one or both bands are darkened. I have not as yet been able to convince myself of the existence of this phenomenon.

As soon as one is certain of the presence of pus, or caries, in one or more of the ethmoidal cells, or in the whole labyrinth, the question of treatment must be considered.

The objects to be aimed at are :

1. Free drainage for secretions.
2. Removal of those secondary changes which keep up suppuration.

For the attainment of the first object, one must first of all remove, as radically as possible, any growths that may be present.

The snare may suffice for small quantities of growth, but when there is much to be removed it is better to take the sharp spoon at once, and use as large a size as possible. I have used one 1.2 cm. in diameter, but I generally employ an oval Volkmann's spoon 6 mm. broad by 1.2 cm. long. With these instruments one gets rid of all polypi in the most rapid and thorough way; but it is always necessary to see what one is doing, and to avoid injuring sound parts, particularly the lower turbinal and the septum.

Kuhnt's (⁷⁷) objections that my directions cannot be thoroughly carried out, and that 'operating in the dark or in the half-dark is particularly to be avoided,' show that his misgivings are due to a very natural want of familiarity with the rhinological technique of to-day.

When the nose has been freed from growths, freer access must be obtained to the diseased cavity by removing larger or smaller portions of those bones which surround the opening. As a rule this bone is already diseased, and then it is easily taken away; but even healthy bone may have to be sacrificed, for the cavity must be exposed at any cost.

The typical amputation of the anterior half of the middle turbinal has frequently to be performed; and more, the partitions between the different cells must (frequently) be removed, in order to make the retention of pus impossible. The conchotome is very useful here; the sharp spoon, too, particularly the ones set at an angle (Plate II., 6 and 7), are often serviceable, especially for the removal of granulations.

In using these instruments there must be no hesitation; the manipulation must be rapid and vigorous, in order to get away as much as possible at a time. The conchotome has this advantage, that healthy bone is easily recognised by its resistance, and, in fact, only diseased and softened bone will come away, as a rule, unless too much force be used.

It is only in working on the lamina cribrosa that much caution is called for on account of actual danger. It is a rule that the horizontal plate ought never to be touched except

when it is perfectly accessible and open to inspection. Even then only a very gentle and cautious scraping of carious areas is allowable, seeing that a single hasty movement might open the cranial cavity.

In caries of the most anterior part of the ethmoid, which is covered by the frontal sinus, one may proceed with less hesitation; perforation of the orbital cells and the lamina papyracea must, of course, be avoided, but their lateral position protects them very much from injury.

Hæmorrhage is the chief hindrance during these operations. The view is very soon obscured; hence, if one would avoid innumerable sittings, the only way is first to take one's bearings very exactly, and then proceed to operate quickly and energetically. This is all the more desirable inasmuch as even the less sensitive patients become in time extremely tender, with their power of resistance sadly shaken—almost neurasthenic, in fact.

Since I have practised the typical amputation of the middle turbinal, I have not found it necessary to use anæsthetics, as this operation exposes at once the whole field of operation.

(The exposure is even more complete than when an external operation is performed, and it is accomplished with less injury, so that this proceeding will continue to be looked upon as the limit of operative interference—by those who are masters of it.)

Hæmorrhage from the interior of the cells which have been opened is checked by introducing into them little pledgets of wadding soaked in a solution of peroxide of hydrogen (freshly prepared). They may be removed in ten minutes, and generally leave a perfectly dry raw surface, no longer oozing. This should be powdered with dermatol, which has the excellent quality of forming a dry crust with the blood. No other dressing is necessary, but the nostril may be loosely plugged with a piece of wadding to keep out the dust. Should hæmorrhage continue, one is compelled to use the gauze plug, but it must be applied exactly to the bleeding spot and, if possible, removed in twelve hours.

When one has been able to proceed in this way and scrape out the suppurating area completely, the raw surface cicatrizes

almost without forming pus, so that one might almost speak of healing by first intention. When suppurating parts have to be left behind, the fresh wound is of course infected, and takes longer to heal.

As regards after-treatment, the following principles must be followed: Free drainage must be provided and maintained for pus and other secretions. Therefore, as soon as bleeding is checked the plug must be given up, for it cannot yet be introduced with sufficient precision into the complicated system of nasal accessory cavities, and purulent secretion is too viscid to be completely conducted away by the gauze.

I have tried introducing drainage-tubes, but find that when the exits are narrow they readily become blocked, and are thus more of a hindrance than a help, whilst when the exits are wide they are quite unnecessary.

Drainage is best provided for by free operation, which removes awkward projections and makes a wide road to the deepest point.

Insufflations or injections of antiseptics in the further course of treatment are absolutely useless, as they are rendered quite inactive by contact with the superficial layer. It is only when the secretions dry and form obstructing crusts that it becomes desirable to soften them by the injection—or, better still, the sniffing up—of dilute alkaline solutions, lukewarm. A loose plug of wadding should be worn in the nostril for the first few days after the operation, especially when the patient is out in the streets. As soon as granulations have formed this may be left off. The duration of treatment and the measure of success which attends it are very variable, as might be expected from the extremely varying extent and degree of the suppuration and the destructive changes. Suppuration of limited extent may, if freely exposed, be overcome in a few days; but in extensive suppuration of the cells no result need be expected under several weeks at least, and as a rule the process goes on for months, often many months, before a cure is obtained. By a cure I understand not only the removal of all discomfort, but permanent and complete cessation of discharge.

Wherever a considerable extent of bone has been exposed, whether by the disease or by the necessary operative pro-

cedures, it is of course self-evident that a long time will be required for cure. No drug can quicken the processes necessary for the covering over of exposed parts; and during the whole of the time that this is going on it is necessary to have the patient come up for inspection at intervals, from once a week to once a month, in order to avoid any threatening retention of secretion.

The following selected cases of isolated empyemata will, it is hoped, add to the clearness of the clinical pictures already presented:

CASE 147.

Empyema of the Ethmoid Labyrinth on Both Sides, but especially the Left. Nasal Polypi.

Miss J. D., aged 49. Since childhood has had a fœtid, purulent discharge from both nostrils, but especially the left; headache, languor, and eye symptoms. Ten years ago the nose was quite blocked by polypi: they were removed at that time; a second time seven years ago, and again this year, by different surgeons. On May 24, 1890, the patient came to me to ask me to remove what remained.

Both middle turbinals were generally widened, of a pale strawberry colour, and slightly uneven surface. They were very spongy, and bled readily, the examining probe sinking into their substance. Both were in contact with the septum, and showed laterally those duplicatures which are so frequently seen in nasal suppuration. (No pus was visible at this time, and it was not till later that the patient mentioned the facts given above.)

As the swellings were not suitable for snaring, the double electrolytic needles were inserted on both sides. Three days later a false membrane separated from the places where the punctures had been made on the left side, and immediately thin glutinous pus welled out through wide openings. The openings were surrounded by small growths, and led into rough-walled excavations inside the middle spongy bone. This was specially distinct on the left side, where the diameter of the cavities was about 6 or 7 mm. The cavities were washed out with a small canula, and plugged with iodoform gauze. Next day suppuration had somewhat diminished, and on the right side also it was found possible to pass a probe into a rough-walled suppurating cavity in the middle turbinal. The instrument entered at the anterior part of the turbinal, rather

to the outside, and passed through spongy swollen tissue. This second cavity was also plugged, and the plugs were renewed daily.

May 31: A small gray polypus projected downwards from the opening in the left middle turbinal. Pressure upon this polypus caused pus to ooze out above it. After its removal the ethmoid labyrinth was exposed to the extent of 2 cm. The discharge of pus was much diminished, and a purulent ophthalmia, which had existed for some months, was also considerably improved. The plug on the right side had to be discontinued, as it caused severe pains in the eyes; on the left side it was continued to June 3, when it had to be given up for the same reason.

June 6: A mass of freshly-prolapsed granulation tissue was removed, exposing freely the carious inner surface, and making retention of pus impossible.

June 9: No pus came away when the nose was blown; headache and fœtor had disappeared. At the anterior ends of the middle turbinals a few loosely-adherent yellow crusts were visible, but when they were removed no pus came away. Discharge had also ceased from the right nostril.

The following report shows patient's condition on June 19: 'Occasionally on blowing the nose there is a slight admixture of yellow pus, but no odour. The head is permanently free, the general condition much improved. The right nostril is quite dry; in the left, on the middle turbinal, there are some broad, soft, yellow crusts, very loosely attached, and behind these the wide opening in the bone can be seen covered with a very slight coating of pus. When this is wiped off, it is not replaced, and no rough bone can be felt.'

In the middle of July the patient showed herself *in statu quo*. Afterwards all discharge ceased.

CASE 148.

Empyema of the Left Middle Ethmoidal Cells. Hypertrophy of the Middle Turbinal.

Mrs. M. K., aged 28, has suffered since childhood from nasal suppuration on both sides with frequent nasal obstruction, for which she has been cauterized. Head always feels somewhat dull.

The right nasal cavity is normal, except for the presence on the floor of the nose of a quantity of tough, glassy mucus, mixed with flakes of pus. In the left nasal cavity there is a smooth lobulated hypertrophy of the anterior end of the middle turbinal. On the median side of this the probe enters a deep

and wide rough-walled cavity in the bone, out of which pus flows. Probing is extremely painful. A layer of pus is visible posteriorly above the left choana.

March 23, 1892: Hypertrophy removed with galvano-caustic snare, and cavity scraped out.

During the next few days there was much headache, and a considerable increase in the quantity of pus. Direct irrigation of the cavity quickly brought relief.

April 14: The cavity still discharges freely, but is now freely accessible. Solid nitrate of silver was applied, after which suppuration rapidly diminished.

Two months later: There is only a slight secretion of white mucus. Head troubles gone. Probing of the cavity (which is now completely lined) is painless. Cure confirmed three years later.

CASE 149.

Polypi repeatedly recurring. Empyema of the Middle Ethmoidal Cells on Both Sides.

Miss B. Oe., 23 years old, has suffered since childhood from nasal discharge, frequently foetid, from both nostrils. Has frequent attacks of headache, which often cause sleeplessness; the headaches have been particularly bad during the last few weeks. She feels generally ill; her sight is often blurred. For three years the nose has been blocked with polypi, which have been frequently removed, the last time a week ago. The probe has never been used.

Condition on examination, March 27, 1892: Both sides of the nose contain pus; in the right nostril it coats the external surface of the middle turbinal. In this situation the probe passes through the very narrow chink between the turbinal and the lateral wall of the nose into a very extensive cavity with carious walls. On withdrawing the probe pus flows after it. On the left side things are in the same condition. *For the rest, the appearance of the nose is almost normal, only that nasal respiration is somewhat restricted, owing to the middle turbinals lying very close against the septum.*

The entrance to both cavities was freely opened up with the conchotome (in successive sittings), and the cavities themselves were thoroughly scraped out. Afterwards they were cauterized with solid nitrate of silver. The headaches disappeared as soon as free drainage was established for the pus. The latter at first increased greatly, and then gradually diminished. Although the symptoms were much improved after about a month, it was not till July 23 that I find the note: 'No headache nor discharge for the last fortnight. General health

much better. Nasal respiration quite free, the turbinals being reduced in size. Rhinoscopic image normal; neither rough nor bare bone to be felt anywhere.' Cure verified two and a half years later.

CASE 150.

Empyema of the Anterior Lower Ethmoidal Cells on the Right Side with Excessive Headache. Cure. Afterwards Fresh Inflammation of the Cells on the Left Side. Cure.

Mr. J. P., aged 34. For six months has suffered day and night from the most frightful headache in the left side of the forehead and in the temple. This has caused weakness of memory, incapacity for work, and at times mental unsoundness and suicidal tendency. A pretty free discharge of pus from the right nostril has only, he says, existed for six or eight weeks.

December 5, 1891: The patient seems lacking in intelligence; it is difficult to get any information from him. The left canine fossa and both supra-orbital nerves are tender on pressure.

The anterior end of the right middle turbinal shows a slight degree of lobulated hypertrophy. The probe reveals rough bone on the outer side of the turbinal, where some pus has accumulated, and still more rough bone on the inner surface.

Puncture and irrigation of the right antrum gave a negative result; nevertheless, the headache disappeared at once.

December 6: After four hours' intermission the pain in the left temple and side of the forehead returned, but less severe. Hypertrophy, and softened bone removed with the conchotome; immediate relief to the headache.

December 8: Headache has quite disappeared, only occasionally there is a transient shooting pain.

January 7, 1892: For a week there has been no shooting pain. As there was still some pus secreted on the mesial side of the middle turbinal, the approach to the bony cavity was freely exposed with the conchotome, and the cavity itself scraped out.

February 28: There is still a slight secretion of pus; otherwise no symptoms. The patient looks blooming, and has quite recovered his activity.

July 22: For three months there has been no suppuration; he has gained much in weight, and his health is excellent. At the inner edge of the right middle turbinal there is a large loss of substance through which one can see into a dry cavity lined

with mucous membrane—the now healed anterior ethmoidal cells. For a week there has been a discharge of pus from the left nostril with headache. On the inner side of the middle turbinal high up, the probe detects caries and great tenderness. A single scraping out of this area removed the symptoms at once, and a week afterwards suppuration ceased.

I may be allowed in this case to point out the extremely misleading localization of the pain, which was most definitely referred to the side opposite to that which was diseased, whilst in the second attack of recent suppuration, the pain was on the same side as the disease. Once more a warning to use the greatest caution in applying subjective sensations or patients' statements to purposes of diagnosis.

The above clinical histories, in connection with Case 98 (p. 104), suffice to present a picture of the more difficult cases of isolated ethmoidal empyema.

The following report may serve as an example of those grave and widespread diseases of the whole ethmoid labyrinth, such as only occur in combination with suppuration in other accessory cavities.

CASE 151.

Empyema of the Left Ethmoid Labyrinth with Extensive Development of Polypi. Bony Atresia of the Choanæ.

Miss M. S., aged 24. Nasal respiration has been deficient since she was quite young, but for the last three years it has been considerably worse, and at the same time a profuse discharge of fœtid pus has developed.

There is mental dulness, headache, and a feeling of pressure over the eyes. Two years ago, and also last year, several polypi were removed with forceps while she was at home.

Present condition, May 18, 1890: The patient has a dull and stupid yet anxious aspect. She cries a great deal, often if one only talks with her for longer than usual. She is very shy.

The right nasal cavity is very much narrowed by a pronounced deviation of the septum; the left nasal cavity is filled by a soft uneven swelling of a reddish-gray colour and covered with pus.

In the naso-pharynx there is a smooth gray shining swelling

of globular shape, beside which the lateral border of the right choana is still visible. This latter swelling was at once torn off with a snare introduced by means of Bellocque's canula⁽²⁵¹⁾. In extracting one of the larger of the anteriorly placed polypi a considerable piece of the middle spongy bone was removed with it. It then became evident that there was a transverse bony partition in the left choana, which left only a small gap at the floor of the nose for the air to pass through, and from whose posterior surface the retronasal polypus sprang. Its anterior surface was also covered with bits of tumour growth.

In the course of the next few days a large number of polypi were removed, and it was then possible to make out that the persistent discharge of fœtid pus came from holes in the middle turbinal. These holes were surrounded by growths and admitted the probe, which after passing through them came into contact with rough bone. The excavations were plugged directly with iodoform gauze. In two days the fœtor was less, and in five days it was gone, and the quantity of pus had become trifling.

Insufflations of iodoform were now made directly into the cavities, and on June 21 the patient was dismissed to her home, as there was only one small opening which secreted traces of pus.

The bony partition had previously been broken down with the sharp spoon and removed piecemeal, so that nasal respiration was quite free.

During the next four months the patient came up for inspection several times. The quantity of pus remained hardly noticeable; occasionally in the morning there was a trace of it on the pocket-handkerchief. Outgrowths of the mucous membrane were several times cauterized, swollen parts were reduced by electrolysis, secreting cavities were touched with chromic acid and nitrate of silver. In October the cavities might be considered as healed, for when dried out with wadding no secretion could be detected on the wool.

Unfortunately, the cure was not permanent, for in December, 1891, the patient presented herself again with the following condition:

Fresh polypus formation on the left side, but not enough to stop nasal respiration.

Fœtid purulent discharge has again gradually developed, but it is much less copious than formerly. The head remains free; only in a hot sun or when stooping is it somewhat dull.

I scraped away the growths energetically with the sharp spoon, and removed a number of pieces of softened and necrotic bone. This required several sittings, and it soon became apparent that the whole system of ethmoidal cells was,

in fact, a reservoir for pus, so that all the thin partitions between the different cells had to be scraped away. At last there remained only the concave hollowed-out framework of the middle turbinal, which consists of a more resistant, smooth plate of bone, and on the outer side the lamina papyracea, while the lamina cribrosa, being healthy, required no treatment.

Unfortunately, the patient returned home before her cure was quite complete, and I have heard nothing from her, but I believe I am justified in hoping that my radical operation produced a permanent cure. My proceedings at first were influenced by the natural hesitation I felt in dealing with what was to me at that time quite a new disease, so that I did not proceed at once to destroy the diseased bone.

In the same way Moldenhauer⁽⁸³⁾ refrained from energetic treatment in his cases of disease of the bones of the nose. The above example shows, however—and that very clearly—how necessary such decided operative interference is, and that the medicinal treatment of diseased cavities has only a palliative effect.

III. Secondary Ethmoidal Suppurations

arise from the extension or rupture of abscesses in neighbouring parts.

Infection of the ethmoid labyrinth from suppuration in the orbit, the maxillary antrum, and the frontal sinus, must be first considered.

Rupture of an orbital abscess into the ethmoidal cells is perhaps not so rare an occurrence as one might suppose from the scanty literature on the subject, for it was a case of this kind that led Riberi⁽¹⁰⁹⁾ to propose the opening of orbital abscesses through the ethmoid. (See above, p. 240).

Nevertheless, we have only three relevant observations at our disposal, made by Mackenzie, Demours and Vossius, and to be found recorded in Berger and Tyrman⁽¹⁶¹⁾. Whether Eales's case, which they quote on p. 28, is to be reckoned as a fourth, it is impossible to say in the absence of exact information on the part of the author.

The diagnosis may be made when in a case of orbital abscess (always easily recognised) pus flows away through the nose.

The cases have more interest for the ophthalmic surgeon than for the rhinologist.

Let us next consider the rupture of frontal empyema into the ethmoidal cells.

In Welge and Knapp's cases, reported by Berger and Tyrman⁽¹⁶¹⁾, it seems quite as justifiable to assume that the cavities were simultaneously diseased, as that they were attacked in succession.

In Steinthal's⁽⁷²⁾ case rupture into the ethmoid was already imminent, for the lamina papyracea had become carious; but nevertheless the rupture was obviated.

In Jansen's⁽⁶¹⁾, Otto's⁽⁶⁸⁾, Kuhnt's⁽⁷⁷⁾, Browne's⁽¹⁸³⁾ and Schutz's⁽¹⁸⁴⁾ cases the rupture had already taken place. The infection of the ethmoidal cells by pus flowing down from the frontal sinus is probably much more frequent. In my own first case of the kind⁽⁴³⁾ this infection had already taken place, for pus was found in a cavity inside the middle turbinal. (In the brief report made at the time, this circumstance is not mentioned, being considered quite unimportant.)

Mair's⁽²⁵²⁾ case is the only one recorded in which inflammation crept up from the maxillary antrum into the labyrinth.

Infection of the ethmoid labyrinth from the sphenoidal sinus has not yet been demonstrated, for the connection between empyemata of such deep-seated cavities could only be made clear on the post-mortem table.

In the case described on p. 132 the opposite route must have been followed, the sphenoidal sinus being the last to be diseased.

Finally, we must consider the rupture of intracranial supuration into the nose. There are two interesting observations.

Chiari⁽²⁵³⁾ dissected the body of a woman of 37 with an abscess cavity which contained air in the left frontal lobe. The air had penetrated through a tear into the first three ventricles. The abscess cavity communicated with one of the anterior ethmoidal cells through a funnel-shaped depression leading to a hole the size of a hemp-seed in the base of the skull. The woman had suffered for ten years from frequent fainting fits, and during the last few weeks she suffered from headache, sickness, inclination to vomit, and a continuous flow

of mucus (?) from the nose. Finally, she became drowsy and died.

Chiari considers that the abscess was a chronic one, which finally ruptured, and caused death by air pressing into the ventricles while the nose was being blown. This explanation is probably correct.

Gaudissant's (²⁵⁴) patient had received three incised wounds on the forehead, one close to the root of the nose, penetrating to the bone. During the fourth week following, all at once, vomiting, slow pulse (12!) and respiration, stupor, incontinence of urine, and constipation, set in. Seventeen days later a large quantity of pus was discharged from the nose, and the brain symptoms disappeared. In a few days they returned, and did not permanently disappear till the brain abscess burst externally through the wound in the forehead. Gaudissant assumes that the discharge from the nose took place through the ethmoid, and this is the most likely supposition.

In earlier times this process was supposed to be self-evident in every case in which there was a flow of pus from the nose. We know now from the rarity of the occurrence how little ground this idea had.

Lesions of the ethmoid from injury, chemical agents (phosphorus, chloride of zinc), etc., cannot be considered in this place, as they do not, strictly speaking, belong to the suppurative diseases.

G. SUPPURATION IN THE SPHENOIDAL SINUS.

SUPPURATION in the sphenoidal sinus has of late years become quite a favourite subject with rhinologists, although previously they fought very shy of it, no one venturing to touch this dark and somewhat dangerous region.

Thus, earlier times have bequeathed to us no clinical histories of such cases, but only the records of post-mortem examinations; and of these only one—Rouge⁽²⁵⁵⁾—has reference to chronic empyema.

Rouge found the sphenoidal sinus full of cheesy pus in the body of a lady who during life had suffered from nasal speech, exophthalmos, strabismus, and pain in the upper teeth, and in whom, before death, left-sided deafness and blindness were added to the picture.

The other recorded dissections, which refer to acute processes and are of great interest ætiologically, will be discussed under that heading. The first observations on the living were Schäffer's⁽⁸¹⁾. On one occasion he found crumbly masses in the sphenoidal sinus (Case 7), in addition to polypi and ethmoidal empyema. On another occasion he cured a case of 'ozæna' by opening both sphenoidal sinuses (Case 34); and on a third occasion he discovered suppuration and necrosis in the sinus to be the cause of a purulent discharge from the choanæ, and the development of polypi on the roof of the nose.

In 1889 Heryng⁽²⁵⁶⁾ recorded five cases treated by him according to Schäffer's method.

Ruault⁽²⁵⁷⁾ next reported the case of a patient whom he had treated four years previously with success, for empyema of the

antrum and nasal polypi. He came back with disease of the sphenoidal sinus. It was successfully opened, and found to contain pus, and the cure was completed by antiseptic irrigation.

According to Hansberg (²⁵⁸), Herzog three times opened the sphenoidal sinus by Schäffer's method by means of a sharp spoon, removing part of the middle turbinal with the galvano-cautery in order to obtain better access.

Hansberg himself, in probing some carious ethmoidal cells, came upon a rough spot at a depth of 9 cm. from the entrance of the nose, and localized it—no doubt correctly—in the sphenoidal sinus.

Next comes a series of communications by Schäffer (³⁵) concerning six cases, of which one was complicated with ethmoidal and another with frontal empyema.

Most interesting of all these is the observation of a rupture of the lower wall of the sphenoidal sinus :

There was severe neuralgia of the right infra-orbital region, which had already led to resection of the infra-orbital nerve. In Rosenmüller's fossa on the right side there was a swelling, which, when probed from the front, was found to contain a channel running backwards under the base of the skull. The bone above was rough. Scraping out removed the pain for the time, but it returned in five days. The sinus was then opened and drained, upon which the pains again immediately disappeared. The final result is unknown.

Of the remaining five cases, four were cured in one, four, nine and twelve months respectively.

Schech's (⁸⁴) first case of purulent discharge from the sphenoidal sinus with caries of the ostium, occurring in the presence of atrophic rhinitis, comes next in order, whilst the case of sphenoidal caries reported in his fourth edition appears to have been due rather to tumour growth.

Next comes a communication by Quénu (²⁵⁹). His patient had caries of the anterior wall, communicating through an open fistula with the nose. As scraping out on two occasions was unsuccessful, Quénu split the nose open and drained, which quickly cured the case.

Baumgarten (²⁶⁰) had a patient, 20 years of age, who had

suffered for two years from nasal suppuration and headache. The anterior wall of the left sinus proved to be necrotic. Opening the sinus produced considerable improvement; further treatment was in prospect. Since the above cases were recorded, communications on this subject have been more numerous, but the clinical picture of the disease which I have constructed from my own experience has not been materially modified thereby, so that I may spare my readers the recital of additional cases.

Ætiology.—Knowledge in this direction has not been much advanced by chronic cases. In this respect the literature is barren. In my own cases I have not always been able to obtain facts and dates bearing on the origin.

Frequently the trouble was definitely referred to a very severe cold in the head—perhaps in the previous year (possibly influenza). In one case a sphenoidal empyema combined with the same condition in the ethmoid and antrum was referred to an attack of typhoid. In another case scarlet fever was the probable cause (here again the ethmoid was involved); and, finally, one patient dated the suppuration, which implicated the antrum, ethmoid and sphenoidal sinus of the same side, from various injuries, which certainly seems very doubtful.

The acute cases throw more light on the subject, and are all the more valuable from the post-mortem examinations thus obtained, which furnish at least some material for the pathological anatomy of the sinus, still sadly defective.

v. Gietl remarked that in his typhoid cases the prevailing facial erysipelas most frequently started from the nose, and upon this he bases his theory that it arises from ichorous inflammation of the accessory cavities. His assistant Zuccarini⁽²⁾ followed up this idea, and really found empyemata in the bodies of three patients who had died of typhoid and erysipelas. In two of the three the sphenoidal sinus was involved.

In one of the two cases the nasal cavity was full of 'puriform mucus'; the mucosa of the choanæ spongy and velvet-like, that of the frontal sinuses swollen; the sphenoidal sinus contained croupous exudation mixed with blood and pus, and its mucous membrane was softened and showed ecchymotic spots.

In the second case the posterior wall of the sinus was

reddened, and it contained a little thin purulent liquid; in addition there was serous infiltration of the mucous membrane of the antrum, and the cavity was full of colourless (?) muco-pus; the ethmoidal cells were free.

In 1881 Weichselbaum⁽³⁶⁾ published a paper describing an inflammatory affection of the accessory cavities, which he called primary phlegmon, and of which he had seen two examples. In addition to suppurations and peculiar croupous exudations in the other accessory cavities, the mucosa of the left sphenoidal sinus was, in the first case, partly injected, partly ecchymosed, and in the right sinus there was also some muco-pus.

The second case showed the same inflammatory process in all the other accessory cavities, but only in the left sphenoidal sinus were there fibrinous plaques.

In addition to the above, he found croupous inflammation and suppuration of the mucosa, along with similar processes in the whole or some of the accessory cavities, in five cases of erysipelas of the face and throat; whilst in two additional observations the process was displayed in its early stage of serous infiltration.

In 1882 Zuckerkandl⁽³⁷⁾ described a very severe form of purulent rhinitis, associated with erysipelas of the face, suppuration in the ethmoid labyrinth, the right antrum, and left frontal sinus; whilst the right frontal sinus, the left antrum, and both sphenoidal sinuses, only showed swelling, injection, and ecchymoses.

In 1888 Weichselbaum⁽²⁶¹⁾ observed a similar case upon the post-mortem table.

A coachman, who had just come out of another hospital after an illness of unknown nature of four weeks' duration, was admitted, suffering from furunculosis, muco-purulent discharge from the left nostril, and nephritis. He had been ill four days. Three days afterwards a focus of suppuration appeared on the left tonsil, and death soon took place from œdema of the glottis.

Post-mortem, a quantity of very tough pus was found in the right nasal cavity, and the right antrum and sphenoidal sinus. Unfortunately, we have no information as to the nature

of the preceding illness, but certainly there was some grave general infection.

Siebenmann's dissection of sphenoidal empyema in three cases of typhoid and several of influenza (p. 3) must be mentioned in this place.

Harke⁽¹⁾, too, found this cavity extraordinarily often diseased, in consequence of acute infections.

In order to complete the series of morbid anatomical changes occurring in this sinus, as determined by post-mortem examination, I must refer to the ætiologically obscure cases recorded by Scholz and Demarquay (pp. 140, 150), and also to my own dissection in Case 103, which enabled me to recognise the first beginnings of a suppuration due to infection from neighbouring parts.

The preceding observations confirm the general experience, according to which most cases of sinus suppuration owe their origin to acute infections, either pure or mixed, as opposed to the view that inflammations of the sphenoidal sinus generally depend upon slowly-extending inflammatory processes of the nasal mucosa.

The fact that the sphenoidal sinus is comparatively rarely diseased alone, is much in favour of this view. In the acute processes which have been, as it were, surprised *in flagranti* on the post-mortem table, there has almost always been combination with other empyemas. Nine of Schäffer's fifty-three, and no less than twenty-five of my thirty-seven cases of chronic suppuration showed this combined condition.

The fact, that amongst cases whose ætiology is known, the pneumococcus, the typhoid bacillus, and the streptococcus of erysipelas, play the most important part (apart from influenza) indicates still more clearly that the acute infections are the principal factors in producing sphenoidal empyema, both acute and chronic; whilst slowly-extending inflammations are not to be excluded, although at present only one concrete example is at our disposal (*vide supra*, p. 132).

Clinical Features.—Surgeons have as yet rarely succeeded in observing acute sphenoidal empyema during life.

Schäffer has seen nineteen cases about which there is no doubt, seeing that in every instance pus was found on opening

the sinus. I dare say that in my experience also several cases have occurred; but, generally speaking, I could not be quite sure of the diagnosis. Cases 3, 4, and 5 of the series of acute suppurations in the superior meatus were probably of this nature.

The following case, however, was unquestionable:

CASE 152.

Acute Sphenoidal Empyema with Complications.

Mrs. A. K., aged 43, has suffered for two years from nasal suppuration and severe pains in the left side of the forehead. Has been several times operated upon at home, and was finally turned over to me, as her doctor diagnosed ethmoidal empyema. An empyema of the left antrum was at once made out, and after it had been operated upon all her symptoms ceased.

Ten days after her return home she was taken suddenly ill, with high fever, great lassitude, and severe pain on the right side of the forehead. Soon there was a copious discharge of muco-pus into the throat. She came back to me. At first there was nothing to be seen, yet probing the right sphenoidal sinus gave relief. A sphenoidal canula was at once introduced, and (blowing through having produced no result) the head was bent well forward and the cavity irrigated. A mass of muco-pus was washed out by the lotion, and the pain immediately ceased.

The case was cured in a week by direct irrigation.

It may be mentioned, as illustrating the diagnostic difficulties in this case, that a week afterwards severe occipital headache set in gradually, and was found on investigation to be uræmic, due to chronic parenchymatous nephritis, of which the patient died two months later.

Thus, the **symptoms** of acute sphenoidal empyema are identical with those of acute suppuration generally (fever, rigors, prostration, dizziness, severe headache, and also, according to Schäffer, a feeling of severe pressure behind the eyes).

For **diagnosis** the same rules must be followed as in the chronic form.

Treatment may be first so directed as to hasten resolution by the removal of swelling (probing, sniffing up alkalies,

diaphoretics, purgatives), and afterwards proceed to the direct removal of secretion by means of a canula introduced into the sinus. In obstinate cases, the same measures would be appropriate as in chronic inflammation.

Chronic empyema of the sphenoidal sinus is very frequent. My own experience includes thirty-seven cases, of which fourteen were bilateral.

The **symptoms** are not so constant as to enable one to draw safe conclusions from them alone as to the seat of disease. But the following features are fairly constant: The discharge of pus is comparatively scanty, and frequently finds its way through the choanæ downwards and backwards, so that a coating of pus is visible either in the fornix, or at the upper edge of the choanæ, or upon the posterior ends of the middle and upper turbinals. In eighteen of my cases the secretion followed this route. For the rest, my experience agrees with Schäffer's, according to which when the pus flows forward it generally shows itself between the septum and the middle turbinal. To found a diagnosis upon this sign would, however, be misleading, for, as shown above, the ethmoidal cells, especially the posterior ones, discharge their secretion in this place.

Again, pus has a strong tendency to find its way round on to the lateral aspect of the turbinal, so that sphenoidal disease may be mistaken for empyema of the antrum, and *vice versâ*.

The discharge, being scanty, dries readily into crusts, and when caries or necrosis of the walls is present it becomes discoloured, grayish-green or hæmorrhagic (brownish-red to black), and fœtid. Fœtor was generally present, and in twelve cases the true 'ozæna' crusts presented themselves. Schäffer also found them in five of his cases.

The growth of polypi seems to be very rare in pure sphenoidal empyema, and occurs rather when there is simultaneous disease of the ethmoid. The mucous membrane of the region is too scanty and too tightly stretched over the bone to have much tendency to overgrowth.

The pain is generally very severe, although I have seen several cases in which there was only a dull stupid feeling in the head. When the sinus alone is diseased, the patients

localize their pains on the vertex, or complain of an unpleasant or painful sensation deep-seated in the head, pointing often to the region of the ear, and thus projecting upon the corresponding part of the surface, a sensation they cannot exactly localize.

Measurements have shown me in more than one case that the spot on the surface of the head where the pain is localized corresponds with the projection of the sphenoidal sinus upon the skull, so that this false localization is not to be considered as radiation. Occipital headache is also complained of. The pain is boring or gnawing, but sometimes it is only felt as a dull pressure.

If the inflammation of bone should spread to neighbouring parts, supra- or infra-orbital pain may occur from irritation of the spheno-palatine ganglion or the second branch of the fifth. Schäffer observed infra-orbital neuralgia in one case, and Rouge⁽²⁵⁵⁾ was once misled by it into diagnosing empyema of the antrum, and actually opened the cavity—another warning never to trust to symptoms alone in diagnosing empyema.

Supra-orbital pain, or pain in the region of the ophthalmic nerve, due no doubt to radiation, I have several times been able to trace with certainty to the sphenoid. Once there was typical otalgia.

The course of chronic empyema is probably generally benign. Many cases are several years old before they come under treatment. The roof of the sinus is much more solid than the lamina cribrosa of the ethmoid, so that rupture into the cranial cavity cannot so easily occur. Nevertheless, it is not unheard of.

It is only necessary to recall observations by Scholz, Demarquay, Flatau, and one of my own—not to mention dissections of sphenoidal empyema in cases of meningitis where the connection was not so clear.

The disease is still more threatening to the optic nerve, as shown by Rouge's and Demarquay's patients becoming blind, and the occurrence of optic neuritis in Fliess's⁽¹⁷⁴⁾ case. The spheno-palatine ganglion, too, may be affected by the extension of inflammation and caused to atrophy, which brings about a condition of diminished sensibility on one side of the face (p. 137).

Rouge's case of deafness on the same side is quite unexplained, as we have no information as to the condition of the ear.

It is, of course, self-evident that a progressive inflammation may cause otitis of the sphenoidal body, and so bring about necrosis and the separation of sequestra. One such sequestrum I have myself removed. The reported cases of Baratoux⁽²⁶²⁾ and Erichsen—quoted by Woakes⁽¹⁴⁶⁾—in which almost the entire body of the sphenoid, including the sella turcica, was discharged through the nose, may perhaps belong to this group; but it seems probable that they should be ascribed to a specific process rather than to a destructive empyema.

The diagnosis is not so difficult as it is generally represented to be. Certainly, it must not be founded upon symptoms alone, but the latter will always be sufficient to direct attention to the sinus. Here even more than in the case of the other accessory cavities the principle holds good, that only when pus or caries is proved to exist in the sinus is a sure diagnosis possible; other signs only indicate probability, often a very weak probability.

When one finds pus or crusts in the characteristic situations we have described, and especially upon one side only, a more exact investigation is called for. Such an investigation can only be carried out with the probe, except in cases where, from atrophy or destruction of the middle turbinal, the anterior wall of the sinus is so exposed that one can see the secretion directly exuding from the cavity, as I have several times been fortunate enough to do. The point of the probe may with advantage be bent outwards. When, on passing the probe backwards and upwards between the middle turbinal and the septum, the point passes through a more or less constricted entrance into a cavity in which it can be moved freely, one may be certain that the instrument is in the sphenoidal sinus, if the distance from the surface corresponds with the depth at which the cavity is known to lie. (A mistake might be made by confounding the speno-ethmoidal recess with the sphenoidal sinus, but the probe can be moved freely downwards out of the former, which is not possible when it is really in the sinus.) The escape of pus by the side of the probe as it lies in the

sinus, or the feeling of rough or exposed bone, completes the proof of the diagnosis.

Tumour formation may produce the same appearances, and must be excluded by attention to the history, the objective conditions actually present, and the course of the case (see p. 124).

If nothing can be seen, or felt with the probe, a sphenoidal canula should be introduced (Plate II., Figs. 9 and 10), and an attempt made, under careful inspection, to blow out the secretion by attaching a Politzer's bag, or to wash it out by attaching a syringe.

The depth at which the sphenoidal sinus lies varies considerably; but, on the other hand, a certain relation is maintained, within comparatively wide limits, between the distance of the cavity from the entrance of the nose and the external measurements of the head.

In my own cases I have always carefully measured the distance from the point of the probe to the spot where the upper lip passes into the floor of the nose, the instrument being held close against the septum; and by repeating the measurements several times I have convinced myself of their correctness, for there was never more than 1 mm. of difference. To these measurements I have added others, *e.g.*, the distance from the root of the nose to the occipital protuberance, the transverse measurement of the skull between the temporal fossæ, and in some cases the distance from the entrance of the nose to the posterior wall of the pharynx. The last measurement, however, is not always of value in establishing a relation to the sphenoidal sinus, inasmuch as it depends upon the position in the horizontal plane of the anterior surface of the cervical vertebræ, which is rarely quite exact; and, besides, the varying thickness and tension of the muscles of the neck and throat influence the result of the measurement considerably. At any rate, it should be taken on both sides.

As the measurements taken must, to permit of comparison, be independent as far as possible of the thickness of the soft parts, the circumferential measurement of the head could not always be taken account of, for although it is otherwise a very important one, yet in the living body the thickness of the

scalp, and especially the amount of hair, cause differences which are too great, and are incapable of correction.

Even when the sphenoidal sinuses are healthy, it is often possible to probe them, so that twenty-two of my measurements were made on such cases, or on doubtful ones, whilst the remaining data were obtained from fifty diseased sinuses.

It was not expedient to measure all my pathological cases—external conditions forbade.

The measurements given in the accompanying table have this advantage over those taken on the skeleton or preserved head, viz., that the external measurements of the head are almost the same as those on the skeleton, whilst the measurements of the sphenoidal sinus express better than normal anatomical preparations could the turgescence of soft parts existing during life, and the differences due to pathological changes.

According to the results of this table, the average distance of the sphenoidal sinus from the entrance of the nose is, in female adults, 7·6 cm.; in males, 8·2 cm. The variations on each side of this mean are not inconsiderable—from 6·0 to 8·2 cm. in women, and from 7·1 to 9·8 cm. in men. No doubt they maintain a certain relation to the measurements of the skull, but the relation cannot be considered constant. This holds good particularly of the simple vertical diameter. Yet if one adds in each case the sum of the vertical and horizontal diameters, one obtains a somewhat more uniform relation.

Now, although these numbers do not by any means enable us to say, the larger the skull measurements, so much the further is the floor of the sphenoidal sinus from the entrance of the nose; yet within certain wide limits they confirm the opinion that in the larger types of skull the sinus will be found to lie deeper; and, in addition, they justify the assumption that in men the sphenoidal sinus will be found at a depth of not less than 7 cm., and in those of larger stature hardly under 8 cm., from the entrance of the nose. Eight cm. and over will be the more frequent result. If it were possible more frequently to measure the distance from the entrance of the nose to the opening of the sinus (*i.e.*, its anterior wall), the results would be more exact, for this measurement must be nearly

A.—WOMEN.

Name and Age.	State of Sphenoidal Sinus and Side diseased.	Distance of the Entrance of the Nose from the				Skull Measurements.		Circumference of Head.
		Posterior Wall Of Sphenoidal Sinus.	Anterior Wall	Posterior Ethmoidal Cell.	Posterior Wall of Pharynx.	Transverse between Temporal Fossæ.	Antero-posterior Root of Nose to the Occipital Tuberosity.	
1. D., aged 16	Empyema bilateral	6'0 right						
2. M. W., aged 11	Healthy; right measured	6'4	—	—	6'8 right	11'0	17'0	
3. E. v. H., aged 45	Empyema right	7'2 right	—	—	7'9 right 8'2 left	12'0	16'5	
4. B. K., aged 26	(?)	7'4 right 7'2 left	—	—	7'9 both sides	11'0	17'5	
5. K. F., aged 34	Healthy	7'3 right	—	—	8'1 right 8'3 left	11'5	18'0	
6. M. G., aged 44	Empyema right	7'3 right	—	—	8'9 both sides	11'3	16'0	50'0
7. T. M., aged 38	Normal	7'4 right	—	—	8'3 right 8'0 left	11'0	17'5	
8. C. v. T., aged 36	Empyema and caries both sides	7'5 left 7'5 right	—	—	8'4 left 8'1 right	11'0	17'5	
9. S. M., aged 18	Empyema bilateral	7'9 right 7'6 left	7'0 right	6'2 left	8'3 both sides	11'0	17'5	51'5
10. A. M., aged 65	Empyema bilateral	7'8 right 7'9 left	—	—	8'0 left	10'5	17'5	
11. T. A., aged 41	Empyema left	7'9 left	—	—	8'8 left 8'5 right	11'5	17'0	51'5
12. K. N., aged 15	Empyema bilateral	7'9 right	6'5 right	7'2 right	8'5 right 8'6 left	11'0	17'0	51'5
13. E. F., aged 28	Acute empyema (?)	7'9 right	—	—	9'2 right 9'0 left	12'0	18'0	
14. M. A., aged 27	Acute empyema (?)	7'9 right	—	—	8'1 both sides	11'0	16'5	
15. M. S., aged 31	Empyema right	8'0 right	—	—				
16. C. R., aged 46	Caries right	8'2	—	—	9'0 right	12'0	17'5	
17. H. Z., aged 37	Caries and empyema left	—	6'3	—	—	12'5	18	

B.—MEN.

1. H. M., aged 43	Empyema left	6'5 left	5'7 left	—	8'8 left	13'0	18'3	56'0
2. R.	Empyema right	7'1 right						
3. S. S., aged 44	Empyema bilateral	7'1 left 7'3 right	—	—	8'6 both sides	11'0	18'5	56'0
4. J. M., aged 32	Caries and empyema right	7'2	6'6	—	—	12'0	17'5	
5. P. S., aged 37	Caries and empyema left	7'4	—	—	9'3	12'0	18'5	
6. G. K., aged 65	Caries right	7'5	7'0	—	8'6 right	13'0	18'5	
7. J. D., aged 55	Normal	7'5 left	6'2 left	—	8'1 both sides	11'75	17'5	54'5
8. J. K., aged 31	Normal, both sinuses visible	7'7 right 7'5 left						
9. H. O., aged 22	Polypi right	7'7 right	—	—	9'7 both sides	13'5	17'3	56'0
10. P., aged 36	Normal	7'8 right						
11. M. O., aged 28	Caries and empyema both sides	7'7 left 8'3 right	—	6'0 left	8'3 left	11'0	18'0	53

B.—MEN (*continued*).

Name and Age.	State of Sphenoidal Sinus and Side diseased.	Distance of the Entrance of the Nose from the				Skull Measurements.		Circumference of Head.
		Posterior Wall Of Sphenoidal Sinus.	Anterior Wall	Posterior Ethmoidal Cell.	Posterior Wall of Pharynx.	Transverse between Temporal Fossæ.	Antero-posterior Root of Nose to the Occipital Tuberosity.	
12. F. S., aged 30	Caries and empyema left; right healthy	8'0	7'1 left 6'9 right	—	—	11'3	18'5	55'2
13. W. S., aged 30	Empyema bilateral	8'0 both sides	—	—	10'0 right 9'8 left	12'0	19'0	56'8
14. J. D., aged 45	Empyema right	8'0 right	6'0 right	—	8'6 right 8'9 left	11'0	18'0	54'0
15. A. B., aged 39	Empyema both sides	8'1 both sides	—	—	8'4 left 9'1 right	12'0	19'0	54'2
16. G. F., aged 36	Empyema right	8'2 right	—	—	9'0 both sides	11'0	19'0	54'2
17. W. S., aged 52	Empyema right	8'3 right	8'1 left	—	8'8 right 9'3 left	12'8	19'3	56'8
18. F., aged 27	Catarrh both sides	8'4 both sides	7'0 left	—	8'9 right 8'6 left	11'5	19'0	55'0
19. S. G., aged 56	Caries and empyema right; caries left	8'4 right 8'6 left	—	7'8	—	13'2	19'5	57'7
20. K. F., aged 25	Healthy; right measured	8'5	—	—	10'8 left 10'2 right	12'0	19'0	57'7
21. M. R., aged 31	Caries and empyema right	8'5	—	8'2	8'3	12'5	18'0	55'5
22. B., aged 16	Empyema right	8'5 right	7'9 right	—	—	11'5	19'0	55'5
23. G., aged 56	Empyema both sides; right polypi	8'7 left 8'4 right	7'8 left 7'6 right	—	9'8 left 9'9 right	12'5	20'2	59'3
24. P. S., aged 38	Normal	8'7 right	—	—	9'5 right 9'4 left	11'5	19'0	55'3
25. K. F., aged 28	Empyema right	8'7 right 8'8 left	—	—	10'2 right 10'0 left	12'0	19'0	57'8
26. F. R., aged 32	Normal	8'8 left	—	—	—	—	—	—
27. J. E., aged 25	(?)	8'8 right 8'9 left	6'9 right 7'2 left	—	8'9 right 9'1 left	12'0	19'0	55'5
28. A. W., aged 65	Empyema left	8'9 left	—	—	9'1 right 9'2 left	12'0	19'0	57'0
29. U.	Normal	8'9 right	—	—	9'0 right	—	18'3	57'0
30. F. K., aged 26	Catarrh both sides	9'3 left 8'5 right	—	—	9'2 left	13'0	19'0	55'5
31. K., aged 44	Catarrh both sides	8'9 right	7'5 right	—	9'5 left 8'7 right	11'5	19'0	55'5
32. L. G., aged 33	(?)	9'5 right 8'4 left	7'7 right 7'5 left	—	9'5 right 9'4 left	13'0	19'5	57'1
33. H. R., aged 48	Normal	9'1 left	—	—	8'7 right 9'4 left	12'0	19'0	55'3
34. W. A., aged 25	Normal	9'2 right	—	—	9'1 right 8'8 left	11'5	19'3	56'1
35. J. G., aged 33	Empyema left	9'3 left	8'2 left	—	9'8	12'5	20'0	60'0
36. J. B., aged 37	Normal	9'5 right	—	—	7'5 left	13'3	20'5	59'5
37. A. L., aged 30	Normal	9'5 left	7'1 right	—	7'5 left	13'3	20'5	59'5
38. M. L., aged 28	Caries and empyema left	9'8	—	7'9	—	12'5	19'5	57'5
39. J. G., aged 24	Empyema both sides	—	6'7 both sides	—	9'1 right 9'2 left	12'0	19'0	57'5

always constant, whilst the depth of the sinus itself in the like case may be altered very much from the healthy condition by swelling and the formation of granulations, and on the other hand by necrosis.

Unfortunately, it is rarely possible in the living to take the distance to the ostium, for one can only be sure of having probed the ostium (anterior wall) when one can also penetrate the cavity, and in the latter case the probe generally finds so little support in the anterior parts of the cavity that it is often quite impossible to get a reliable measurement of it.

For this reason I have only been able to satisfy myself of this anterior distance in the case of twenty-four cavities, in which it varied from 6.0 to 8.2 cm., averaging 7.09 cm., less by 1.1 mm. than the average measurement obtained by Hansberg⁽²⁵⁸⁾ on the cadaver. This trifling difference vanishes if one allows 1.1 mm. for the turgescence of living tissues.

One can take one's bearings still better by keeping as close as possible to the choanæ in every case. The anterior wall of the sinus forms the upper edge of the choanæ, so that by starting from this point with the probe one is in no danger of losing one's way in the posterior ethmoidal cells or the superior meatus.

For the rest, in interpreting the results of examination with the probe it must never be forgotten that the sphenoidal sinus shows very great anatomical differences in the normal condition, and still more in pathological states.

Its depth is very variable (even according to my few measurements on the living, from 0.5 to 2.0 cm.) ; the opening is sometimes a very small hole, not admitting even a thin probe ; at other times a wide gap, either natural, or made so by destructive inflammation.

Owing to the relatively large size of the cavity, every part of the internal surface that can be reached by the probe must be most carefully examined with it, as otherwise small carious spots may easily escape detection.

The anatomical relations of the sinus and its hidden position do not generally allow us to make out more than the presence of pus in the sinus or the existence of rough bone in its walls ; but by operation the cavity can be so exposed that a consider-

able part of the inner wall is open to inspection, and any changes that may be present in the soft parts can thus be definitely diagnosed. (See p. 36.)

Treatment, to be appropriate, must consist in the employment of surgical measures with a view to obtain ready access, and the removal of diseased parts, without wasting time in irrigation, insufflation, etc. To this end Schäffer's maxims commend themselves—a wide breach in the anterior wall and scraping out the cavity. The middle turbinal must be removed, partly or entirely, if it should prove to be in the way either of ready access or free drainage.

The typical amputation is often required, but this is not always sufficient. In order to provide free and permanent drainage, the removal of the lower wall may also be called for, and this may be easily accomplished with a good strong conchotome.

The cavity may be scraped out with Schäffer's spoon-probe, or with my smaller-sized sharp spoons (Plate II., Figs. 4 and 5); the one depicted in Fig. 5 is specially suitable for destroying the anterior wall and scraping the posterior wall. One may work quite freely in the horizontal direction, and downwards, for posteriorly the thick body of the bone is a protection against serious injury, and to break through in the downward direction only improves the free drainage it is one's object to provide.

When the anterior wall is very strong, it is a good plan first to make a smallish hole at its lower part with the sharp spoon or the electric drill, and through this hole to introduce one blade of the conchotome, or else to employ a forceps cutting from before backwards, like the one I had made at the suggestion of Dr. Schutter of Groningen (Plate II., Fig. 2).

In this way I have treated forty-five sinuses in thirty-four patients. In only nine cases was the sphenoidal sinus alone affected; in all the others there was disease of several other cavities. The time required for cure never exceeded four months, and several cases were quite well in a few weeks.

From this it is evident that the sphenoidal sinus is, comparatively speaking, one of the most satisfactory of the accessory cavities to treat.

In order to illustrate the clinical history, particulars of three cases are given below :

CASE 153.

Empyema of the Right Sphenoidal Sinus and the Ethmoidal Cells. Caries of the Left Sphenoidal Sinus.

Mr. S. G., aged 56, has suffered for several years from occasional headache, which of late has become so severe and persistent that he is obliged to avoid all active movement and abstain from alcohol ; he suffers frequently from sleeplessness. No pus comes away anteriorly when the nose is blown, but all the more finds its way into the throat, whence after much hawking and retching it is finally spat out.

A year ago a polypus was removed from the right side. In the middle meatus on the right side there are several polypi, and after their partial removal the headache became much worse, so that at the next examination, which disclosed a very painful carious area on the outer wall opposite the middle turbinal, the patient repeatedly fainted.

When the probe is introduced upwards and backwards between the middle turbinal and the septum, it penetrates at a depth of 8.4 cm. into a rough-walled cavity, from which pus escapes by the side of the probe. This is the sphenoidal sinus ; its lower anterior border is covered with granulations. On the left side of the nose it is also possible to probe the sphenoidal sinus ; it is wide open and its floor feels rough, but it contains no pus as far as one can see.

With forceps and the sharp spoon the rotten carious part of the middle turbinal was removed, along with granulation tissue and numerous polypi concealed in the middle and upper meatus ; the carious outer wall was scraped. No plug was required, and there was considerable immediate improvement.

Five days later : Head much better ; pus, diminished in quantity, is now evacuated by blowing the nose. Left sphenoidal sinus scraped out.

A fortnight afterwards : Right sinus scraped out.

During the following weeks it was necessary several times to scrape small areas of rough bone and granulations, while the suppuration became trifling, and the headache was only occasional and slight.

The patient then ceased to come, but he sent me word several months later that he was quite content with his condition. This seems to be the case, for he has become an enthusiastic cyclist.

CASE 154.

Caries of the Right Sphenoidal Sinus with Polypi.

Mr. S. K., aged 65. In June, 1890, I removed polypi from his right middle turbinal. Next he complained of 'phlegm gathering in the throat,' for which I ordered him glycerine of tannin. (Thus I overlooked the real cause of the symptoms, my experience at that time being smaller.)

March 13, 1892: The increased secretion from the throat still continues, and for the last month he has had headache, deep-seated in the head, and on the vertex. When the probe is passed on the right side between the middle turbinal and the septum, it encounters rough bone at a depth of 7 cm. in the region of the sphenoidal sinus.

A month afterwards the patient returned, saying that his pains had almost disappeared since the probe was used; only now and then there is slight 'twitching' in the head. Secretion from the throat diminished. Sphenoidal sinus scraped out.

March 18: Discharge much diminished.

March 28: No discharge. Still slight occasional headache. Cavity cauterized with solid nitrate of silver. Probing no longer painful.

Three years afterwards he was seen again, and the cure found to be permanent.

CASE 155.

Empyema of the Left Sphenoidal Sinus and of Both Ethmoidal Labyrinths.

Mr. P. S., aged 37, complains of attacks of headache affecting especially the left side of the forehead, the left temple, and the vertex. He has been subject to the attacks for six or seven years; they recur two or three times a week, and frequently disable him completely from working. Smoking and alcoholic drinks bring on the pain at once.

A fœtid discharge from both nostrils has existed as long as the pain. It is most profuse on the left side, and especially abundant in the morning. Much secretion is also spat up; it is said not to be fœtid. For the last four years polypi have been removed once a year from both nostrils by a well-known operator. The probe has never been used.

January 29, 1892: In the left nasal cavity there is a thin coating of pus on the anterior surface of the middle turbinal, but no other abnormality of any consequence; in the right

nasal cavity, on the other hand, there are small polypi and granulations on the inner border of the middle turbinal.

The probe detects extensive caries on the inner side of both middle turbinals, and it penetrates on the left side upwards and backwards to a depth of 7.4 cm., and thin liquid foetid pus escapes as the probe is passed. The sphenoidal sinus from which the pus comes is carious on its inner wall. The probing is very painful. A part of the diseased left middle turbinal was removed at the same time in order to give free access, and the cavity was scraped out.

February 11: No return of headache; discharge slight and odourless; probing only a little painful.

February 27: No headache. No pus comes when the nose is blown, and only very little escapes into the throat. The left sphenoidal sinus is already covered with granulations, and secretes only small quantities of light yellow mucus; a fairly good view can be obtained of its interior.

On the right side the suppurating cavity in the middle turbinal was scraped out, in spite of the difficulty of access, and the narrow approach to it between the septum and the middle turbinal was thoroughly enlarged by removing pieces of bone.

March 6: Left nostril quite dry; head free. The patient drank five glasses of beer last evening without any unpleasant effect.

April 8: On both sides the sinuses are well exposed and free from secretion. No discharge at all.

The permanency of the cure was confirmed three years afterwards.

Allied to empyema are inflammations of the mucous membrane, which furnish a purely mucous secretion, in masses, and which are therefore better designated as catarrhs. Milder measures suffice for their treatment. Sometimes they may be cured by direct irrigation through the canula. More obstinate cases, with severer symptoms, require the same treatment as chronic suppuration. I have observed four cases of this kind, and of these only one was unilateral.

H. SUPPURATION IN THE FRONTAL SINUS.

SUPPURATIONS in the frontal sinus have been divided into suppurative catarrh and empyema. The latter term has been applied to cases in which the pus is retained by closure of the exit opening, whilst cases in which there is a free drainage of secretion are designated catarrh. This division seems to me to be too artificial, for in the course of a chronic suppuration the ostium may at one time be closed and the pus retained, constituting an empyema according to this nomenclature, and at another time the exit may be free, so that only a purulent catarrh would be said to exist.

It is better, therefore, to speak simply of suppuration in the frontal sinus, especially as the symptoms of the two forms may be identical.

The designation 'catarrh' should be reserved for those extraordinarily rare cases in which the secretion is purely mucous.

It is not my intention in this place to describe exhaustively the whole special pathology and treatment of this cavity; **evident frontal empyema** is so well known and so adequately treated of in the manuals of surgery that I need do no more than refer to it. It is that form of suppuration in which the pus is completely shut in by closure of the natural opening, so that it is forced to seek an exit through the walls of the cavity and through neighbouring organs—a condition which is well known to the general surgeon, calling as it does for immediate interference. Only the transitional forms shall here claim any share of attention.

Latent empyema, on the other hand, claims our keenest interest. It produces no obvious external change, and betrays its existence only by a purulent discharge from the nose,

certain abnormal appearances in the interior of the nose, and various subjective symptoms, often extremely deceptive.

The interest attaching to latent empyema is as much greater as its diagnosis is more difficult than that of the evident form.

The origin of frontal empyema has been already discussed, in so far as it does not depend upon known external causes (injuries, foreign bodies, parasites). Probably the most frequent causes are retention of secretion in acute catarrh, or from growths, in consequence of inflammation of neighbouring cavities or mucous membranes, and pneumo- or strepto-coccus infections, as observed by Zuccarini and Weichselbaum; but it is often difficult in a chronic case to say which is at fault.

The symptoms are ambiguous: large quantities of secretion frequently evacuated at a time may cause suspicion to fall upon the sinus; sometimes the localization of the pus in the nose may give us information, but this can only be considered reliable when the pus is actually seen to flow from an opening which has been proved by the probe to be the ostium of the sinus. The mere fact that pus is present in the most anterior part of the nose, on the roof, or external to or in front of the middle turbinal, signifies nothing particular, for this sign may be due to suppuration on the lamina cribrosa, or in the orbital and frontal ethmoidal cells, or even in the maxillary antrum. Killian⁽³⁹⁾ ascribed a certain diagnostic value to the character of the pus and its green colour, but this lacks confirmation.

An observation of Schäffer's is of more value. He noticed an atrophic condition of the mucous membrane of the septum at the part where the pus continually trickled down. The mucous membrane assumed the appearance seen in 'pharyngitis sicca,' and at the same time a ridge-shaped swelling developed on which crusts formed. Certainly the appearance is by no means diagnostic, for according to my observations it may be produced by suppurative processes of other kinds, whether on the roof or in the upper regions of the nose, *e.g.*, the upper ethmoidal cells, just in the same way as the hypertrophy or polypoid degeneration of the anterior end of the middle turbinal which Jurasz⁽¹⁴⁰⁾ found thirteen times in twenty-two cases of frontal empyema.

The ridge-like swelling observed by Schäffer must not be confounded with the swelling so often seen on the tubercle of the septum.

Doughy swelling of the skin or circumscribed redness on pressure may be observed when rupture is imminent, but these signs do not occur in latent empyema.

The subjective symptoms are still less significant. Pains in the region of the frontal sinus, *i.e.*, at the root of the nose, above the orbit, in the temple towards the orbit, etc., occur just as frequently in ethmoidal suppuration as in frontal—perhaps more so; and, indeed, the symptoms of both sphenoidal and antral empyema may simulate those of frontal empyema in the most deceptive way. Seeing that the anterior and middle ethmoidal cells (sometimes also the posterior), and the antrum, discharge their secretion into the middle meatus in the same way as the frontal sinus, it is obvious that the greatest caution is necessary in appraising the value of these symptoms. On the other hand, in two cases which I observed, the pain was confined exclusively to the back of the head (one was a case of secondary abscess of the frontal bone), and Krecke (¹²²) noticed the same localization in a similar case. Again, pain may be entirely absent, as occurred in four of my patients.

Localized tenderness on pressure over the lower wall of the sinus, towards the orbit, is mentioned by Kuhnt (⁷⁷) as a characteristic sign. It is, of course, present in empyemata which are approaching rupture, but in really latent cases it may be entirely absent, and, on the other hand, it may be present in its most typical form when the frontal sinus is perfectly healthy. Thus, it is not a pathological sign.

Schech (⁸⁴) remarks that the absence of disease of the teeth is against antral empyema and in favour of frontal, but this is by no means always so. In one case, after removing polypi from the middle meatus, I observed pus oozing from the infundibulum high up, and at the same time there was typical supra-orbital neuralgia occurring spontaneously, and also when pressure was made upon the supra-orbital foramen or notch. All the teeth were healthy, and yet an empyema of the antrum was the cause of all the trouble, as was proved by exploratory puncture and the complete disappearance of the symptoms after opening the cavity.

Speaking generally, it may be said that all those phenomena which we have already described as common to focal suppuration occur occasionally in frontal empyema.

Thus, the **Diagnosis** can only be considered certain when it has been proved that the sinus discharges pus; and this proof is only complete when the identity of the cavity has been demonstrated by the introduction of a probe, or by direct irrigation.

The 'pumping-out' manœuvre recommended by Bresgen⁽⁹¹⁾ by means of cotton-wool wrapped round a probe is not sufficient, as it does not enable one to determine with certainty the source from which the secretion flows. Only the probe can furnish more precise proof.

The probing of the frontal sinus, introduced into practice by Jurasz⁽²⁶³⁾, is only supposed to succeed in one-sixth to one-fourth of the cases (Winckler²⁶⁴). Apart from the irregularities in the course and position of the exit duct in relation to the vertical plane, as already described by Jurasz, the principal obstacle to probing the sinus arises from the fact that in many skulls the ostium looks backwards, and so cannot be reached from the entrance of the nose. The probing can only be considered successful when, after introducing the instrument between the middle turbinal and the uncinatè process, it assumes such a position that the point must lie in the frontal sinus, and when the length of probe which has been introduced corresponds with the distance to the interior of the cavity as measured on the outside of the skull in the person who is being examined.* If this precaution (the measuring) be neglected, the probe may find its way into the bulla ethmoidalis and remain there.

These theoretical requirements are, however, rarely fulfilled in practice, for the exit from the sinus, being concealed in the upper part of the infundibulum, is only accessible in a few cases, and thus, although under specially favourable circumstances the disease may be easy of recognition, once in a way, yet in the majority of cases as they actually occur it is difficult; and, indeed, it is not too much to say that the diagnosis of

* Schäffer's proceeding of passing a probe between the middle turbinal and the septum, and breaking through the lower wall of the cavity, cannot be called probing: it is of the nature of operative interference.

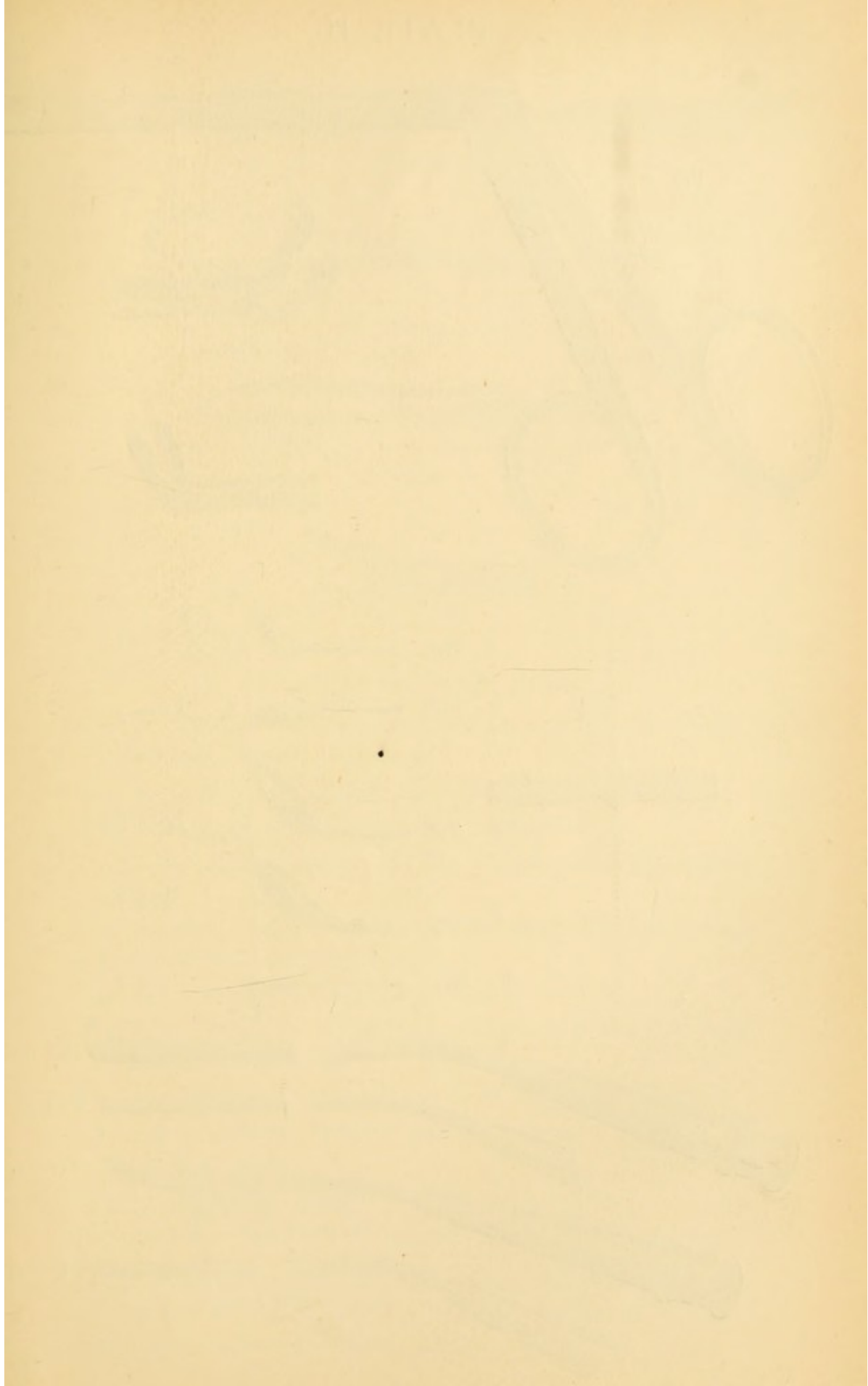


PLATE II.

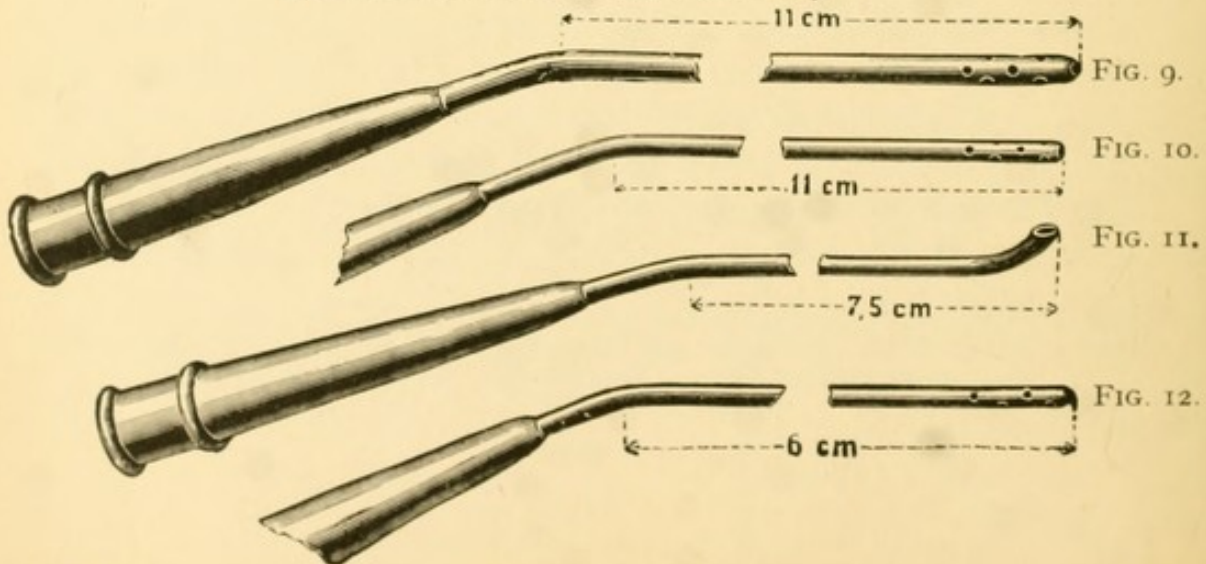
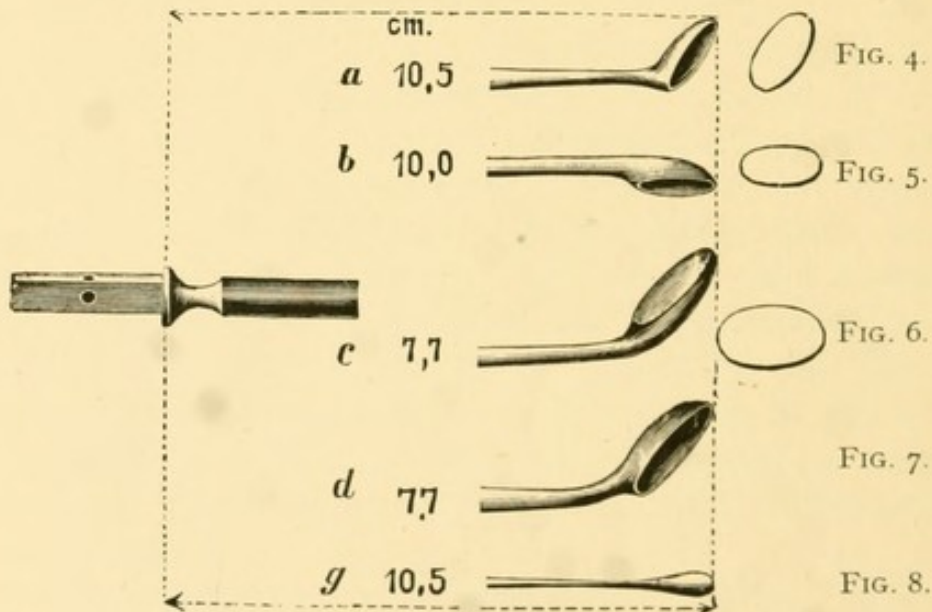
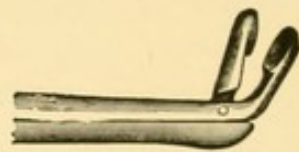
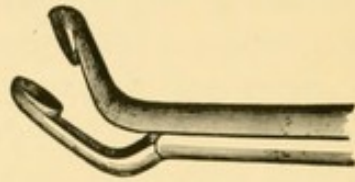
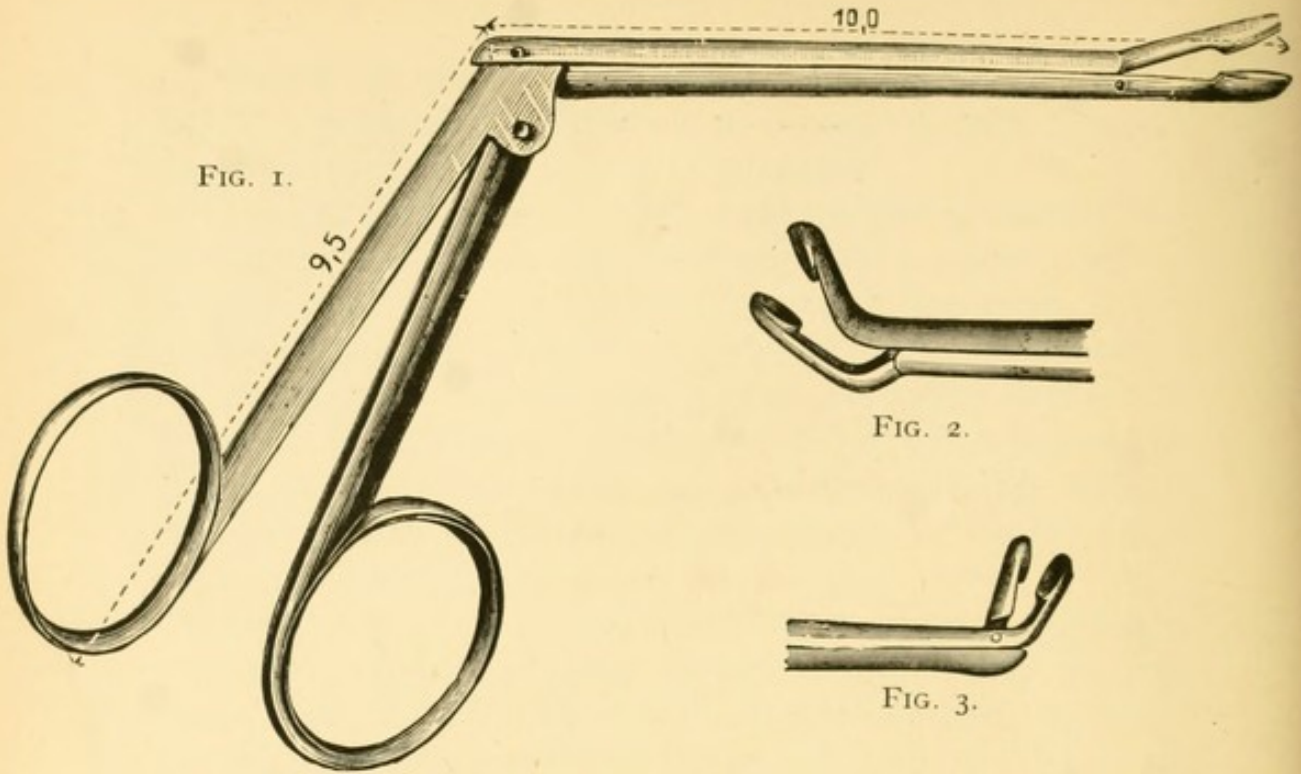


PLATE II.

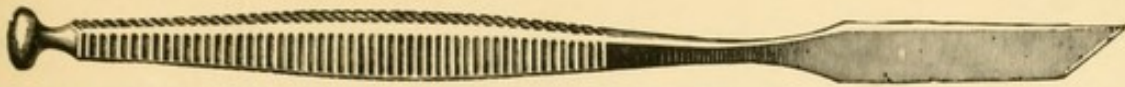


FIG. 13.

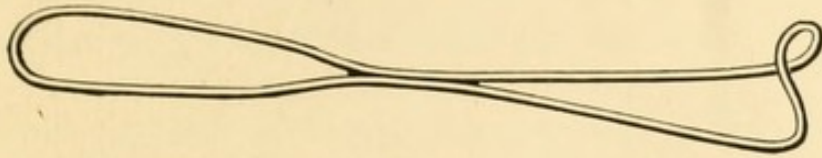


FIG. 14.



FIG. 15.

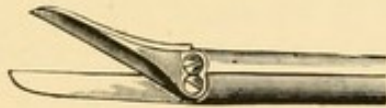


FIG. 16.

DESCRIPTION OF FIGS.

FIG. 1.—Straight-cutting bone-forceps or conchotome; natural thickness; length shortened.

FIG. 2.—Ditto, cutting from above downwards.

FIG. 3.—Ditto, cutting from before backwards.

FIGS. 4-7.—Sharp spoons, and Fig. 8 probe, all fitting handle Fig. 15.

FIGS. 9, 10.—Straight canulæ for the sphenoidal sinus, with anterior and lateral openings.

FIG. 11.—Canula for the frontal sinus.

FIG. 12.—Canula for the maxillary antrum, closed at the end with lateral openings.

FIG. 13.—Oblique cutting chisel for the maxillary antrum.

FIG. 14.—Upper lip holder (half size) used in opening the maxillary antrum.

FIG. 15.—Handle, half size.

FIG. 16.—Scissors for bone and soft parts.

The above instruments are made by C. Stiefenhofer, Munich. The forceps shown in Fig. 3 is after a pattern of Herr Gudendag's, of Amsterdam and Paris.



latent frontal empyema is more difficult than that of any other empyema of the accessory cavities. Here, as in the case of the antrum, it is a good plan to blow air in directly during careful inspection, so that one may see the pus well out. During the subsequent irrigation the patient ought to feel distinctly the cool stream as it penetrates into the cavity, and particles of pus ought to be seen to come away. The irrigation (and insufflation) are carried out through a canula with a knee-shaped bend, of suitable length and provided with a lateral opening. Those I use are 12 cm. long and 2 mm. in diameter (Plate II., Fig. 11).

When the lower wall of the sinus is carious, and the natural approach to it is thus enlarged, or a new and wider approach provided, the diagnosis is of course much easier, especially as it is then much less difficult to pass the probe or the canula. Under such conditions I was able on one occasion to make a sure diagnosis.

The accessibility is also increased when the sinus opens freely into the infundibulum instead of into a naso-frontal duct. Nevertheless, even under such favourable circumstances Winckler⁽²⁶⁴⁾ failed several times in passing the probe on the cadaver. If one cannot pass the probe directly into the sinus, or decide definitely whether the pus comes from the frontal sinus or the antrum, the diagnostic tampons already described must be employed. One tries first to plug the hiatus semilunaris so that no pus from the antrum can escape through it. Then after a variable time the control observation is made. A few minutes may be long enough to wait when the secretion is profuse, or several hours when it is scanty. The pus may be retained above the plug, or it may flow away in front of the plug, whilst the pus from the antrum is dammed back behind the plug. When the pus from the various cavities shows differences of colour, smell, or some other striking feature, as has happened in several of my cases, it greatly facilitates diagnosis.

When the conformation of parts allows of it, one may, after carefully cleaning the nose, pack a plug into the infundibulum as high as possible above the hiatus, so that the ostium maxillare remains free. One can then wash out the antrum from the

lower meatus, or through any artificial opening that may have been made, till it is certainly free from liquid, blowing air through afterwards so as to avoid mistaking the remains of lotion for discharge from a cavity. If then, after removing the plug, pus appears, it certainly comes from one of the sinuses situated higher up, and if in any considerable quantity (in relation to the time occupied by the observation), it must come from the frontal sinus.

Sometimes, however, the anterior nasal cleft is so narrow that even a small quantity of secretion or a slight hæmorrhage, such as may so easily occur, vitiates the rapid and certain judgment which one would otherwise be able to form from the secretion which flows down when the plug is removed; or, again, no pus may be visible, but only mucus. In such cases attention to an apparently trifling circumstance is sometimes helpful. Let me illustrate my meaning by an example: A patient has had the antrum opened, but, in spite of careful treatment, the discharge persists, and this gives rise to a suspicion that other cavities may be involved—possibly the frontal sinus. The nose is most carefully cleaned, and the antrum is blown through from the artificial opening, the nose being carefully inspected at the same time; copious purulent discharge flows down over the lower turbinal; the cavity is irrigated, and much pus is washed out. Now, nothing could be more natural than to say: ‘The antrum is not yet healed; the discharge is explained.’ And yet one looks in again after once more cleaning the nose, and, behold! there is again secretion to be seen; but this time it is pure mucus, as clear as water, and not lying on the lower turbinal, but anteriorly in the upper nasal cleft, and coming from the frontal sinus. The explanation is as follows: the purulent secretion of the frontal sinus flowed away simultaneously with that of the antrum. But while the latter, being quite clean from repeated irrigation, furnishes no visible secretion for a few minutes at least, the imperfectly emptied frontal sinus continues to secrete, or, at least, allows the remains of the secretion it has just formed to flow out. Its purely mucous nature indicates this (see p. 84). One would still have to exclude the bulla ethmoidalis and anterior ethmoidal cells; the quantity of the secretion would

be one point in evidence, and, of course, the results of probing.

It is clear, that by the observation of all the circumstances above mentioned, both those which are naturally present and those which are artificially produced by the examiner, one may frequently attain to certainty even in difficult cases. Not always, however, although no doubt the great majority of frontal empyemata may be thus recognised.

Our only other resource is the artificial opening of the sinus. This can only be done in two places: (*a*) the lower wall of the cavity near the ostium; (*b*) anteriorly after chiselling open the glabella.

Schäffer recommended breaking through the lower wall with the sharp spoon, and this on therapeutic grounds, in order to open the sinus widely. This procedure—the making of a false passage—is perhaps possible without danger when caries is present (I have myself done it once successfully), but in the majority of cases as they occur in practice it would be almost impossible; and this view is confirmed by Winckler's investigations. The bone is sometimes so thick that the sharp spoon will not penetrate it (as I found on one occasion), and few would care to take the risk of using a chisel and mallet in such a region as this, incompletely exposed to view, and subject to the greatest possible variation in anatomical features, the nature of which it is impossible to ascertain in advance. Any injury inflicted in such a case would be ascribed directly to want of skill. The danger of opening the cranial cavity through the lamina cribrosa is too great to justify the attempt.

A safe route remains to us through the anterior wall. No doubt it involves a skin wound, and that in the face, consequently some disfigurement. The disfigurement may, indeed, be rendered minimal or practically nil, by adopting the line of incision recommended by me ⁽⁴³⁾ in suitable cases, but nevertheless this circumstance weighs so heavily that the experimental external opening is only considered justifiable in those suspicious cases which urgently demand interference from the severity of their sufferings, especially severe persistent headache or cerebral symptoms. In one case in which there was the strongest possible suspicion of bilateral frontal sinus

disease, and in which it was impossible to establish the diagnosis *per vias naturales*, I ventured upon the external operation with a successful result.

As regards transillumination as a diagnostic aid, the same objections apply as in the case of the antrum. Especially is it quite inapplicable when there is a free escape for secretion, for a sinus from which the pus is continuously draining must present the same physical phenomena as a healthy one. Thus, its value is only conditional in the diagnosis of closed empyemata and tumours, and differences in the anatomical arrangement of the bone must be very carefully allowed for. The application is made by pressing against the lower and inner wall a Vohsen's lamp, surrounded by a vulcanite mantle open at the top. I have not as yet got a positive result in any case.

Treatment may sometimes be limited to providing free drainage. For this it is necessary to remove all swellings or growths in the infundibulum; and further, to render this entrance permeable, the passage of the probe may also have to be considered, in case this should prove to be feasible, which in the majority of cases I very much doubt.

The air-douche administered by Hartmann's⁽²⁶⁵⁾ method may be very useful in acute catarrhs, but in chronic suppuration it will certainly not suffice. Irrigation, when possible, certainly gets rid of the secretion more effectually. Under abnormally favourable conditions this expectant method of treatment may occasionally produce a cure; as a matter of fact, I have twice (in the same patient) seen suppuration cease in the frontal sinus after the removal of the infundibular cells.

Lichtwitz⁽²⁶⁶⁾, too, once got a cure from irrigation alone.

But, in spite of the apparently favourable situation of the ostium low down in the cavity, irrigation alone is never sufficient if secondary changes have taken place in the lining membrane of the sinus. These secondary changes may consist in the conversion of the lining into a pyogenic membrane, or the development of granulations or polypi, or even caries. Another reason why irrigation fails, is that the lateral part of the floor is frequently deeply hollowed out, and the hollow acts as a reservoir. Pus formed in such cavities may be drained

away ever so nicely, but it is always being formed afresh. Thus, in most cases, in order to bring about a real cure, it is essential to make a wide opening in the inner wall by some suitable method, and to provide for continuous drainage through a counter-opening. The indications for these measures are found in the uselessness of milder treatment, and the existence of painful symptoms which call for relief.

The same two routes are open to us as in exploratory opening, about which I have already said all that is necessary.

Schäffer was fortunate enough to accomplish the scraping out of the sinus, and the application of caustic where that seemed needful, *per vias naturales*. Apart from the danger, the same objections apply to this method in respect of after-treatment as to treatment through the natural ostium. For the mere removal of secretion access from above is generally necessary.

The ease and safety of trephining from without must also be taken into account.

The operation is performed as follows: A vertical incision is made exactly in the wrinkle produced by the corrugator supercillii, consequently very close to the middle line. The incision need not be longer than this wrinkle, *i.e.*, about $1\frac{1}{2}$ cm. When the forehead is very smooth and free from wrinkles, the incision may be made at the upper edge of the eyebrow, and parallel with it. This incision was adopted in five cases; it was made 3 cm. long, extending from the middle line outwards. In one case a horizontal incision was made from the centre of the vertical one, and this was the only instance in which the cicatrix was much depressed. After pushing back the periosteum, a small mesial opening is chiselled, and it is well to proceed with the greatest caution till the sinus has been certainly opened. Its delicate mucous membrane is easily pushed back, differing in this respect from the dura mater, which is also thicker and firmer. Pulsation may occur in either case, and is not peculiar to the dura. The mucous membrane having been divided, one examines with the probe in order to find out whether the cavity of the opposite side has not been opened, a contingency which the very variable position of the partition between the two sinuses renders not very improbable.

If the passage to the nose prove to be open, or only obstructed by changes in the soft parts, it will be sufficient to enlarge the opening, so that all the recesses of the sinus are accessible to touch. Growths of the soft parts and diseased areas of bone should next be carefully removed with the sharp spoon or the bone-forceps (Plate II., Fig. 1). If this should cause free hæmorrhage, the exit towards the nose may be temporarily plugged, in order to prevent the blood from reaching the upper air-passages; this enables us to dispense with the dependent position of the head. A plug is then inserted, and the wound is partly stitched, leaving space for subsequent treatment. The plug is dispensed with after three days, and the cavity is irrigated by means of the canula (Plate II., Fig. 12), which is introduced into the cavity, but not into the exit opening.

After the first ten days I have always allowed the patients to do the irrigation themselves, as by that time a fistula had formed.

Boiled alkaline solution was used for the irrigation, and in the meantime the little fistula was covered with wadding and a small silk pad.

Ten frontal sinuses were treated in this way; six of them were healed in periods varying from six weeks to six months; in five the permanence of the cure was confirmed at least six months later. Two patients with bilateral disease withdrew from treatment before they were cured.

In one case there was a recurrence of suppuration after a year, apparently in the same cavity. On opening it, however (a very easy matter), it was found empty; the suppuration was limited to the infundibulum. Irrigation from above soon checked the discharge; the cure was confirmed one year later. Insufficient width of the exit passage, whether primary or the result of pathological changes, or such a condition of the interior of the cavity as forbids a *restitutio ad integrum*, may compel us to take more radical measures; either very free communication must be established with the nose, or the frontal sinus must be permanently deprived of the power of forming secretion.

The former alternative may be attained by Killian's⁽⁵⁹⁾

method of temporary resection of the nasal bone and exposure of the exit passage from the front, after the removal of the presenting infundibular cells. The proposed formation of a flap composed of skin and bone (apparently from the anterior wall of the frontal sinus), to be immediately replaced, might also be taken into consideration, but would not be necessary if the after-treatment were conducted in the way I have indicated above.

As yet I have had no opportunity of employing this method, as the drainage in my cases has always been free enough; but if the indications were present, I think I should give it a trial.

It appears to me doubtful if this method will suffice for all cases; I believe that occasionally it will be necessary to make room by resecting the upper part of the septum. This could, of course, be done through the same incision.

It is evident that other methods of proceeding may come in question under special circumstances, as in Luc's⁽²⁶⁷⁾ case, for instance, in which he took advantage of a wide passage through the ethmoid labyrinth in order to close the upper wound at once.

The obliteration of the frontal sinus demands, firstly, the complete removal of the mucous membrane; and, secondly, either the filling up of the lumen with granulations, or its permanent exposure.

The first object is attained by the complete removal of the anterior wall. I was once obliged to do this in the case of both sinuses in the same patient, as there was carious destruction of the posterior wall complicated with cerebral abscess⁽¹⁵⁴⁾. The cure, although delayed by the abscess, was complete in ten weeks; the result was confirmed a year later.

Kuhnt⁽⁷⁷⁾ employed this method in a series of cases, and recommends it for general adoption. Following his recommendation, I lately performed the operation on a large sinus in which there were papillary new growths of the mucous membrane. The after-treatment consisted in immediate suture, just leaving room for the introduction of a very loose plug. This was removed in a week, after which the plug was changed every three days. There was no suppuration, and the anterior

wall was replaced by bone, the periosteum having been preserved.

Kuhnt has earned our hearty gratitude by his strong recom-

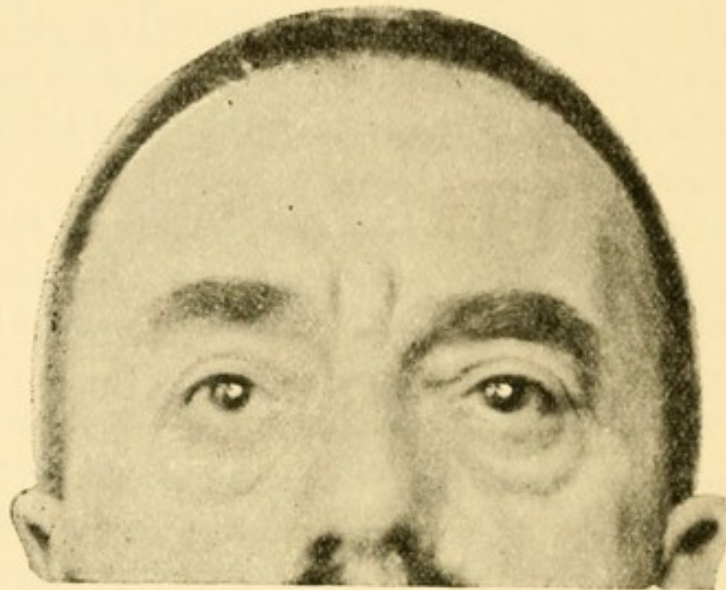


FIG. 6.

Right sinus operated upon May 4, 1890⁽⁴³⁾; limited caries of outer wall. Four years later latent empyema of left sinus; operation on January 8, 1895. Left sinus opened and right reopened, as it had lately been infected from the other side. Fœtid pus and polypi found in both sinuses. Cure in six weeks, the patient applying irrigation with boiled alkaline solution. Cure confirmed eight months afterwards.



FIG. 7.

Latent empyema of frontal sinus, combined with suppuration in the ethmoid and antrum, of at least fourteen years' duration, probably the result of erysipelas. Operation on April 14, 1894, with horizontal incision. Removal of small polypi and an exotosis of the posterior wall; scraping out of softened bone. Treatment by irrigation as above; cure of the cavity in six weeks. Confirmed after six months.

mendation of this method. In all complicated cases I believe it to be the method of the future.

The permanent exposure of the cavity is accomplished by

Jansen's operation, which consists in the complete removal of the lower wall and the scraping out of the cavity, which subsequently becomes covered with epidermis. A wide communication, of course, exists between the orbit and the sinus. Quite apart from the fact that to attain this result several months' constant plugging is required, I cannot at all agree with Jansen's opinion that the disfigurement is very slight. On the contrary, the appearance of a case which the author was good enough to show me impressed me very unfavourably. I would much rather see even a deep depression on the forehead than this yawning gulf above the eye. In Jansen's book the photographs, with their kindly shadows, quite fail to convey the ugly impression of **mutilation** produced by the cases.

Seeing that the same result may be attained without dis-



FIG. 8.

Latent empyema of at least five years' duration; headache; combined empyemata on the right side (sphenoid antrum and ethmoid). Opened by horizontal incision on April 26, 1895. Mucosa smooth and dark red. Very deep external orbital recess. Five days later irrigation as above. Cure after four months; confirmed two months later.

figurement by the subcutaneous filling up of the cavity after resection of the anterior wall, Jansen's operation is never called for.

The scar, after partial or complete resection of the anterior wall when the vertical incision is used, is so hidden in the corrugator fold that one only notices on looking closely that the wrinkle is rather deeper than usual; the horizontal incision leaves a visible scar, but at the most it is only slightly depressed.

I. COMBINED EMPYEMATA,

COMBINED empyemata, which involve several cavities on the same side simultaneously, merit separate consideration, on account of the interest attaching to them both from a diagnostic and therapeutic point of view. Under this heading, strictly speaking, only those cases are included in which the empyemata are concurrent and on the same side, because in them the disease of each separate cavity, and its diagnosis and treatment, are in the closest possible relation to those of the other cavities; but disease of two cavities on different sides does not require a separate designation, as each of them is independent, like any other solitary empyema.

Two diagnostic difficulties confront us :

1. The proof that the pus comes from more than one cavity.
2. The identification of the affected cavities.

If, as is generally the case in disease of the ethmoidal cells, the antrum, and the sphenoidal sinus, one can furnish direct proof of the involvement of each separate cavity, the difficulty is not particularly great. Yet special attention must be directed to the fact that empyema of the ethmoidal cells may simulate antral suppuration, even when exploratory puncture and irrigation are performed. Therefore, before doing this the middle meatus must be most carefully cleaned from every trace of pus, as otherwise pus from the ethmoidal cells flowing into the middle meatus is liable to be mistaken for pus from the antrum.

The diagnostic tampon must be frequently used for damming off particular regions. For particulars of this method I must refer readers to pp. 162, 211, and 214.

The most difficult matter is to ascertain whether the frontal

sinus is involved or not. If copious purulent masses are deposited in the anterior regions of the middle meatus, or in the anterior nasal cleft, it is, according to my experience, quite impossible in most cases to say whether the discharge comes from the antrum alone or from the ethmoidal cells (which I will assume to be certainly diseased), or from the frontal sinus also.

Only the damming off of particular regions can help us to isolate one from another, and sometimes differences in the character of the secretion of different cavities (see pp. 84 and 248).

‘The diagnosis is very difficult when the antrum and the frontal sinus are simultaneously diseased; certainty is only attainable by exploratory puncture of the antrum’ (Schech⁸⁴). True, one may clearly make out that the former cavity is diseased; but certainly not that the latter is healthy. For this the puncture of the frontal sinus would be required, but the necessity for such a step may be obviated by damming off the other cavity (or cavities), or else by curing them by suitable treatment, so that they discharge no more. It may be taken as a maxim in diagnosis, applicable to all empyemata, that if suppuration continue profuse after the opening (and treatment) of one or more diseased cavities, the existence of another focus of suppuration may be assumed. Thus, if all the other sinuses are certainly healed, or if their secretion differ in quantity and character from that of which the source is undetermined, then *per viam exclusionis* the frontal sinus must be in fault. Only in this fashion have I found it possible to establish the diagnosis of frontal empyema in cases in which other cavities were diseased, and in which I could not pass the probe.

Thus, in one case, after damming off the antrum and opening the middle ethmoidal cells, suppuration continued almost as profuse as before; and this directed my attention to the frontal sinus, which was discovered to be the source of the discharge.

Again, in two cases of very profuse suppuration of the antrum, ethmoid labyrinth, and sphenoidal sinus of one side, the cavities were opened one after another, with much tedious work, and finally cured; and yet the patients returned com-

plaining that the suppuration was unabated. The cavities which had been treated were found to be healthy, and the discharge was then, of course, easily traced to the frontal sinus.

In some cases it is very easy to make out that several cavities are diseased, when they happen to be more or less accessible; and in other cases it is just as difficult to make out that the antrum and frontal sinus in particular are free from disease; indeed, this conclusion can frequently only be reached by exclusion.

One other difficulty must be considered, namely, that of deciding which cavities are cured and which are still discharging, in cases where several have been under treatment at the same time.

This refers particularly to combined empyema of the antrum and frontal sinus; but the difficulty may be got over by blowing through (or into) each cavity separately during careful inspection of the interior of the nose. Otherwise one may consider as healed, and empty, a cavity from which the lotion (boiled saline solution) returns clear, while all the time the contents have been washed out, and are lying concealed in the recesses of the nasal cavity. *Visa refero, non relata.*

As regards their course, combined empyemata show great dependence upon one another. Thus, suppuration of the ethmoidal cells may be kept up by sphenoidal empyema on the one hand, and frontal or antral empyema on the other; and in the same way empyema of the antrum may be dependent upon suppuration of the ethmoidal cells or frontal sinus.

Killian⁽³⁹⁾ refers to this latter combination, and I myself had the opportunity of demonstrating one case in which the antrum had been chiselled open, but would not heal till the frontal sinus was dry⁽⁴³⁾. Other conceivable combinations have also been observed under circumstances which showed their interdependence. For instance, MacDonald⁽⁴²⁾ reported the rupture of an ethmoidal empyema into the antrum.

In my other cases of combined empyema, I was only able in one instance to prove the connection—which no doubt existed more frequently—for it was impossible to exclude the possibility of primary simultaneous disease of several cavities. This was true of Knapp and Welge's cases, in which the frontal sinus

and the ethmoidal cells were found to be diseased at the same time. (See pp. 264, 265.)

I have been struck by the scanty references in the literature to combined empyemata. Whilst of my 220 patients seventy-six showed such combinations, Schäffer records only four out of fifty-seven—a noteworthy difference.

It is impossible to form an estimate of the frequency of combined empyemata from other authors; some of them, *e.g.*, Kuchenbecker, paid no attention to complications, and others have not sufficient material to draw conclusions from. However, Harke's (1) dissections confirm the frequency of combination.

The nature of the combination in my cases presented every conceivable variety.

As regards **treatment**, the exposure of the region in the middle meatus into which nearly all the sinuses open will be expedient in many cases. This is accomplished by the typical amputation of the middle turbinal. The separate cavities may then be taken in hand.

In cases of frontal empyema complicated with suppuration of the ethmoidal cells, the latter may sometimes be freely exposed by the operation on the frontal sinus, and even the sphenoidal sinus may be reached in the most severe cases. Otherwise, one generally proceeds successively, for the excellent reason that the existence of a combined condition can only be recognised in many cases after the success of the first efforts in treatment.

To undertake the opening of some or all of the sinuses (even from without, as I have seen it done), not because of the failure of every other diagnostic means, but for purely exploratory reasons, must be considered a *testimonium paupertatis*.

In cases where several cavities are diseased, if all cannot be treated simultaneously, the one that is situated highest up should be taken first. Usually this will be the first to heal.

No one who has not actually treated such complicated cases can form any idea of the expenditure of time and patience required on the part of the doctor, his task rendered all the more difficult by the depression of the patients, morally exhausted as they are by the length of the treatment, and only

to be kept up to the mark to some extent by progressive improvement. The typical amputation of the middle turbinal has, it is true, removed many of these terrors; but even yet the expenditure of time is extraordinary, for one must wait after every little operation till the reaction has passed off before doing anything further.

This is the reason why so many patients withdraw prematurely from treatment, some before they have really begun to heal, others in an improved condition, but without any certainty of permanent cure. Merely reading over the clinical histories of the cases of this sort which have hitherto been observed conveys a somewhat inadequate idea of the impression they make on one in practice; to make my readers realize this fully, I should have to bring such a wealth of detail as to greatly exceed the limits of this work. Every experienced rhinologist will bear me out when I say that the treatment of combined empyemata is the most difficult and tiresome task that can fall to the lot of the specialist in our department.

In comparison with the gravity of the disease, the objective results are not so satisfactory as they ought to be, but the improvement in the patients' feelings is most satisfactory.

The **duration of treatment** in my cases varied from two to eighteen months. It must be remembered, however, that this long time was chiefly occupied in watching and waiting upon slow changes in the bone, which was often extensively diseased, and that the patients' sufferings were removed in a vastly shorter time, generally in from a week to a month. Only in three instances did they last longer. Much time is also consumed in long pauses between the separate operations, so that my patients often did not require to come up for inspection for months at a time.

The sufferings of such patients are generally very considerable, and in the majority of cases have lasted for many years, embittering life and resisting all sorts of treatment; and this explains why it is, that in spite of trouble and difficulty, the treatment of combined empyemata may be considered one of the most thankful tasks in rhinology, for the sufferers appreciate most gratefully the relief afforded them.

A P P E N D I X .

A. THE RELATION OF SYPHILIS TO NASAL SUPPURATION.

WE know what nasal suppurations are ; if we now proceed to compare them with the inflammations of the interior of the nose which result from syphilitic infection, perhaps a question as to the nature of this infection may appear quite superfluous to the majority of my readers. Nevertheless, what do we understand exactly by nasal syphilis? Perhaps we may learn something more about it by resolving to ask the question.

The answer must needs be : Nasal syphilis comprises all the direct effects of the syphilitic poison upon the nose.

If we scrutinize closely the so-called syphilitic nasal affections, we are compelled to recognise that this definition no longer fits the majority of them, or, at least, does not fit them exclusively. Pathological anatomy furnishes us with no better means of recognising active syphilitic processes than the test of specific treatment—most properly so called. Iodide of potassium and mercury are said to be the specific antidote for the active effects of the syphilitic poison, and yet they frequently disappoint us here, whilst in other and more accessible regions of the body we see the same forms of the disease, especially the tertiary ulcer, react to them in the promptest way. Why?

The answer must be hypothetical, just as the nature of the syphilitic poison and its reaction to mercury and iodide of potassium are hypothetical ; but, none the less, I think it is logical. It may be put as follows : Inflammations and new

formations, which no longer yield to specific treatment, are not due to the exciting cause of syphilis, but to other causes, which, although they were no doubt originally started by the syphilis, are now capable of exerting an independent influence, and of inducing inflammation and other disturbances of nutrition.

We have seen that chronic suppurations of the deeper parts of the nasal cavity owe their persistence to the fact that the complicated anatomical relations of the parts interfere with the natural tendency to cure, or delay the removal of inflammatory products. Exactly the same obstacles hinder the healing of syphilitic ulcers in the nose. An ulcer which has been freed from syphilis poison by specific treatment, behaves on the surface of the body exactly like a traumatic ulcer which has been freed from irritation; it heals kindly. In the nose, on the other hand, such a sore heals with difficulty, or not at all, because there is no proper drainage for secretions, and the anatomical conformation of the parts impedes or renders impossible the spontaneous separation of the products of syphilitic necrosis.

In both places, and also in situations where secondary infection is out of the question (namely, in the closed cavities of the body), evidence of disease persists after the cure of the active syphilitic process, irreparable injury to the vessels causing progressive disturbance of nutrition.

From this it follows that the persistent or progressive inflammatory and necrotic changes which take place after the end of the active stage, when the specific influence is exhausted, ought not to be considered as syphilitic, but rather deserve the name of 'post-syphilitic,' and have no special claim to be regarded or treated otherwise than as non-specific infections, or as traumatic inflammations and necroses. The importance of this view becomes apparent when one comes to practical examples; it enables us to perceive that many apparently actively syphilitic processes are rather post-syphilitic, conditioned by mixed infection with pus-cocci; and especially that gummatous infiltrations change their character with the occurrence of ulceration, as they then become exposed to mixed infection; it indicates the reason why many affections are so

difficult to cure, and explains why cure is only possible when the treatment is conducted from this standpoint.

It explains why Schuster (⁴⁰) was able to cure many, even deep-seated, ulcers of bone 'of specific nature' by persevering cleanliness and local treatment. They were no longer syphilitic, but post-syphilitic suppurative ulcers, in which 'strict cleanliness,' in the sense of the removal of discharge, continuously or as frequently as possible, must, in the absence of necrosis, lead as certainly to cure as in the 'non-specific bone affections,' as Schuster rightly surmises.

The latter also heal as soon as they are kept scrupulously clean.

It has been found empirically that such lesions, both of bone and soft parts (recognisable as secondary from their chronic course), may be dealt with most successfully by purely local treatment, without the removal of large sequestra, which always seems such an essential measure to the surgeon; and if this interpretation of these changes as post-syphilitic, but no longer specific, be generally adopted, we shall have a rational basis—not merely a variable empirical rule—for the treatment of the pathological changes consequent upon nasal syphilis.

It will no longer be permissible to judge of the success of local treatment, applied without any fixed indication, by the more or less 'favourable impression' of various authorities, but there will be a fixed and certain indication for it as soon as the lesions present fail to respond—or are unable under the circumstances to respond—to antisyphilitic treatment.

At the same time we get light upon a disputed question—though, indeed, it is more a matter of words—viz., whether the empyemata which occur in consequence of syphilis are syphilitic or not. Whether they are due to the action of the poison upon the walls of the sinuses, or to the opening of the cavities by syphilitic necrosis and subsequent pyogenic infection, they *are* syphilitic as long as they react to certain known remedies, and only to those; they are post-syphilitic as soon as they resist specific treatment. As we cannot tell in advance whether specific treatment will prove useful or not, we have a strong practical interest in being able to distinguish quickly and certainly the ordinary suppurations from those in any way

connected with syphilis; but we have also a theoretical interest: we want to know whether certain changes in the nose are necessarily of a specific nature. In the latter relation, of course, a negative result of specific treatment has no significance; post-syphilitic processes can only be recognised by their clinical and anatomical features, seeing that therapeutically they cannot be distinguished from non-specific diseases.

Let us consider the distinctive features of those forms of syphilis which are usually accompanied by such a considerable amount of suppuration as to be liable to give rise to difficulty in diagnosis.

In doing this, it is necessary to avoid the common mistake of comparing, without distinction, each form and stage of the specific processes with the inflammatory diseases, taking syphilis as a whole. We must go rather more minutely into the differentiation.

Primary syphilitic lesions need not be discussed; apart from their extreme rarity, they would be readily distinguishable from suppurative disease.

Secondary papules also have been very rarely observed in the interior of the nose; perhaps they may be concealed more frequently under the guise of 'syphilitic snuffles' in very young children. In other cases, as at the entrance of the nose, the form of the lesions enables them to be recognised, and the general symptoms—especially the skin eruptions—and, in addition, the degeneration signs of hereditary syphilis, betray the real nature of the case.

Nevertheless, a mistake may be made with regard to the acute infectious processes, so frequent in children, and that especially when the secretion is profuse. But as the latter admit of a relatively favourable prognosis in children of tender age, one is justified in adopting an expectant attitude, and contenting one's self in doubtful cases with simple cleanliness, carefully observing the general condition, and paying special attention to the history and mode of origin. An insidious beginning without the precedence of an acute infectious disease is more in favour of syphilis. The consideration of important dates in the family history (abortions, rashes, falling out of the

hair, etc.) is so obvious that it only requires to be mentioned. The differentiation of the processes of the tertiary period is much more complex, owing to the frequent absence of general symptoms.

The active stage of this period often presents diagnostic problems of great difficulty, inasmuch as there is sometimes a complete absence of characteristic features in the beginning, and, indeed, often for many months. Fœtor, ulceration, simultaneous affections of the skin or of the other mucous membranes, may all be wanting, so that no suspicion is aroused of the constitutional nature of the illness. Such cases most of all lead to confusion with other diseases; the absence of discharge generally prevents them from simulating empyema. There may, however, be a moderately free secretion, which conceals the real character of the ulceration before it has assumed a characteristic form.

The localization of the changes then assumes a certain significance from a diagnostic point of view.

If the centre of suppuration be on the septum, it is almost certain to be syphilitic; the simple traumatic ulcers of the anterior part of the septum never occur by themselves when they are associated with considerable discharge; the increased secretion in such cases originates either in a chronic folliculitis of the entrance of the nose, or in some deeper-seated focal suppuration. Where one is unable to come to a decision soon, as to whether secretion which appears at a particular part of the septum really originates there or comes from somewhere else, careful observation will sooner or later reveal characteristic changes in the mucous membrane (*e.g.*, infiltration, breaking down, speckled discoloration, extreme vulnerability); or, finally, characteristic ulceration occurs, such as is peculiar to specific processes in the nose and its neighbourhood.

The following case illustrates the possibilities just discussed:

CASE 156.

Syphilis simulating Nasal Suppuration.

A workman of 32 was under treatment for catarrh of the middle ear. All at once he developed a profuse nasal discharge of yellowish-green pus, the source of which for long defied detec-

tion, although the secretion was always found in the lower meatus. At last a small carious area was discovered with the probe on each side of the vomer, far back, and close to the floor of the nose, and shortly afterwards perforation of the hard palate took place near its posterior edge, and in direct communication with the ulcer of the septum. The pus remained liquid, mixed with mucus, and devoid of odour; only after a considerable time did it become slightly foetid. The patient acknowledged to having had syphilis, and the ulcer in the palate healed in a few weeks under iodide of potassium. The suppuration on the septum persisted, and withstood several scrapings, the discharge continuing profuse, perfectly liquid, and almost odourless—very different from the ordinary secretion in nasal syphilis. Several months afterwards the diseased areas on the vomer healed under the use of an alkaline lotion sniffed up into the nostril.

Even a less characteristic localization than the septum need not prevent one from suspecting syphilis as soon as the case deviates to any considerable extent from the ordinary course of suppuration due to cocci. Syphilis has the atypical as its type. It may, though rarely, be localized in the nasal meatus and the accessory cavities, as well as in more superficial parts.

To conclude from this that empyemata may frequently be of a masked syphilitic nature (thus trying to build a sophistical bridge for the opponents of non-specific bone disease) would be all the more a mistake, seeing that, whatever the localization may be, there is bound to be a development of characteristic signs, either in connection with the local affection or the general symptoms, without which the diagnosis 'syphilis' would be hypothetical and unproved.

Gerber⁽²⁸⁶⁾ asks in connection with the above case: 'Supposing that the little spots of syphilitic caries had not been situated on the vomer, but on the nasal wall of the antrum or on the ostium frontale, and thence had infected those cavities?' The question answers itself, and this would be apparent even to the questioner as soon as he realized the meaning of his question. It must, in the first place, be proved that the parts in question are 'specifically carious.'

As the originally syphilitic character of many affections of bone and mucous membrane, especially in the concealed recesses of the nose, is not at first evident, it is quite possible

in many cases to mistake specific—*i.e.*, post-syphilitic—suppuration for purely local disease. Yet regard for this possibility should never carry us so far as to make us regard every case as syphilitic, even when devoid of characteristic features, simply because the patient in question has once been infected with syphilis.

Schuster⁽⁴⁰⁾ in his first case seems to have successfully avoided this pitfall; whether Gerber⁽²⁶⁸⁾—pp. 17, 18—and Hellmann⁽²⁶⁹⁾ have been equally successful seems to me very doubtful.

Syphilitic persons are very numerous, and empyema of the accessory cavities is very frequent; why may not the two diseases often enough occur in the same individual, even if at different times? It is not justifiable to assume the syphilitic nature of a process which presents no distinctive features, on the strength of an old history of syphilis; and just as little do we need the history of syphilis to enable us to recognise a characteristic syphilitic lesion.

In the last-mentioned cases, at any rate, other characteristics were not present.

The 'smooth tongue' in Hellmann's case has, at the most, only a historical significance.

To adduce necrosis of bone as evidence, would only be permissible if the view that all destructive lesions of bone in the nose must needs be syphilitic had not been disproved (see p. 11, *et seq.*). There was no active syphilis, for the effect of specific treatment can only be applied as a diagnostic test when no other possibly effectual measures have been taken, as in Gerber's first case. There must always be a doubt as to whether the 'great improvement' (?) noted after the employment of iodide of potassium was really due to the drug; and the fact that the second patient was sent home with directions for inunction is, to my mind, just as little in favour of the existence of syphilis, as the improvement which followed the simultaneous employment of surgical measures and iodide of potassium.

Again, the subjective improvement in the third case after iodide of potassium, seems to me just as likely to have been due to the natural variations in the symptoms (known to be

very great in ordinary empyemata) as to the remedy ; and this view derives support from the fact that the objective signs were the reverse of improved after the 'cure,' and the development of polypi which took place is more suggestive of ordinary empyema.

The following case, which lately occurred in my practice, shows how very cautious one must be in judging of the subjective action of specifics.

CASE 157.

Old Empyemata. Co-existent Misleading Symptoms of Masked Syphilis.

Mrs. A. B., aged 21, has suffered since childhood from the formation of crusts in the nose, frequently fœtid. She complains now of headache, of six weeks' duration. The pain appeared first in both ears, then in all the teeth ; now it occupies the left temple and is continuous, but worse at night. She has morning vertigo, and her hair falls out. During her three years of married life she has had three children ; the first two died at three and twelve months respectively ; the third was born dead at the eighth month ; it was not decomposed. Examination of the nose revealed empyema of both sphenoidal sinuses, but no sign of syphilis. Nevertheless, the history and the peculiarity of the symptoms suggested iodide of potassium. Two days after beginning it the appearance of glandular swellings behind the ears, and a tophus of the left half of the frontal bone, confirmed my suspicion ; four days later the headache was gone. That the empyemata in this case were not syphilitic was shown by the absence of any characteristic nasal changes, and by the fact that their course and duration were quite unaffected by antisiphilitic treatment. Probably, also, they were in existence before the syphilis, but this, as usual, was extremely difficult to make out.

Thus, one may have all the subjective, and some of the objective, symptoms of nasal syphilis without the disease being present ; active syphilis and active empyemata may exist concurrently.

Finally, it is well known that nasal syphilis is capable both of causing empyema of the accessory cavities and of simulating ordinary suppuration, and this fact does not in the least require to be supported by such doubtful reasons. For an

example of the latter condition I need only refer to the case reported above; for the former we have better examples in the cases of Lewin and Heymann⁽²⁷⁰⁾. In those cases there was well-marked syphilitic disease of the mouth, and characteristic ulceration of the nose, which had led to necrosis of the lower turbinal and opening of the antrum, with secondary mixed infection of the cavity. Thus, there was typical empyema of the antrum arising through syphilis, though only of a post-syphilitic nature, for the syphilis in originating the empyema exerted only a traumatic influence. Such cases are very rare, and I take this opportunity of adding one to the number.

CASE 158.

Syphilitic Necrosis of the Upper Jaw, with Perforation of the Antrum.

Mrs. M. R., aged 33. Three months ago she began to have a discharge of fœtid pus from the left nostril, with nasal obstruction on that side. Two months ago the three front teeth in the left upper jaw became loose, painlessly, and were easily removed by a dental mechanic, who at the same time detected loose bone and sent her to a doctor.

According to the patient's statement, Dr. S. several times removed black and fœtid particles of bone from the alveolar process. During the last six or eight weeks an ulcer of the palate has developed.

Present condition: The three first teeth in the left upper jaw are wanting, and also the anterior alveolar margin. In the gap one sees a fistulous opening corresponding nearly with the second incisor tooth, and a very little fœtid pus is also visible. On the hard palate, about 2 cm. from the alveolar margin, and crossing the middle line to the left, there is a raised patch about 2 cm. square. In the centre of this patch is a little ulcer covered with fœtid pus, and bare bone—as yet immovable—can be felt with the probe. The probe penetrates from the gap in the alveolar margin upwards and outwards in the neighbourhood of this ulcer into a wide cavity, and at the same time blood escapes from the nose. The lower turbinal is much swollen, and lies against the septum so that no view of the interior of the nose can be obtained. There is pus between the turbinal and the septum. Posterior rhinoscopy normal.

Treatment.—Pot. iodid. with quinine and iron wine.

Three days later: Nose somewhat freer, fœtor continues,

suppuration rather less. On injecting water through the alveolar fistula it flows in a stream from the nose.

The patient withdrew from observation, as the question arose of removing the necrotic bone.

Direct syphilitic infection of the accessory cavities is also known to occur.

As a rule, the destruction of parts in syphilis is so extensive that only slight operations are required in empyema; but considerable interference may also be necessary, exactly as in ordinary suppuration. A case⁽⁴³⁾ I formerly published may serve as an example of this, and Baumgarten⁽²⁷¹⁾, Dubreuil⁽²⁷²⁾, Winckler⁽²⁶⁴⁾, Treitel⁽²⁷³⁾, and Kuhnt⁽⁷⁷⁾—p. 124—have recorded similar ones. (Necroses of sphenoid, frontal, and ethmoid bones.)

Of the older observations, I may mention those of Berthrand, Brody, Graves, Trousseau⁽¹⁶¹⁾ and Spencer Watson⁽²⁷⁴⁾, which were concerned with syphilitic destruction of the frontal and ethmoid bones. It was impossible to mistake the syphilitic nature of the disease in any of those cases, and I only mention them here in order to prevent anyone from 'discovering' them as examples of specific empyema, and drawing the conclusion that 'therefore' all empyemata with lesions of bone are syphilitic.

I do not think I need discuss in detail the frequent opening and exposure of neighbouring accessory cavities from the interior of the nose by syphilitic ulcers, any more than I need insist upon the fact that here, as in all other regions of the skull, necroses and sequestra do occur.

Some observers seek to discover syphilis, or at least a masked syphilis, in the most benign forms of nasal suppuration, and I wish, therefore, to emphasize the fact, that in no case has syphilitic inflammation of an accessory cavity been found without very severe disease of bone; whilst in empyemata due to pus-cocci there is very frequently no bone disease.

Finally, it must be observed, that even to the most experienced, cases will occur in which one will be unable with perfect certainty either to diagnose active syphilis or post-syphilitic disease, or to exclude them—at least, in the first instance. The application of antisyphilitic treatment will soon

settle the former alternative one way or the other; as regards the latter, one may be obliged to content one's self with leaving the question open. In this way abuse becomes impossible. *In my own statistics, I have strictly confined myself to those cases in which the diagnosis was complete, and confirmed by a sufficient lapse of time.*

As regards treatment, at any rate, there need be no doubt as soon as one adopts the standpoint advocated above. Even if one were unable to decide whether syphilis were concerned in the origin of a particular affection (and such uncertainty is quite rare), the doubt need not worry us. As soon as a case fails to react to specific therapeutics, the treatment is chiefly concerned with local obstacles to cure, which is practically the same thing as saying that post-syphilitic suppuration and suppuration due to cocci require one and the same treatment. As the latter has already been adequately discussed, we need only refer to what has been said above.

It is evident from the preceding paragraphs that the after-results (or sequelæ) of post-syphilitic processes must be the same as those of suppurations due to other causes. The whole series of symptoms already described as occurring in the latter—diseases of neighbouring parts, and other consequences—are also observed in the former, and are, of course, from our point of view, to be expected *a priori*. That grave lesions are no rarity in such cases follows from the destructive nature of syphilis.

We have still to consider the relation borne by the residua of syphilitic processes to nasal suppurations. These are distinguished from post-syphilitic affections by the fact that they represent conditions rather than processes. Their true nature can often, though not always, be recognised by the scars and losses of substance, characteristic in appearance or position, of old syphilis.

Old syphilitic lesions, especially such as run a submucous course, may heal in such a way as to leave no trace, as I have already mentioned (p. 77).

Tumour formation, too, such as betrayed the nature of the process in my cases, may be entirely absent, so that the picture of 'genuine' atrophy is produced in a most deceptive fashion.

Zuckerkindl's⁽⁴⁷⁾ observations on 'Syphilitic Rhinitis, which leads to Primary Atrophy of the Turbinals without Necrosis,' refer to this condition. For the rest, I may say that in cases where there was a suspicion of some such old concealed process I never found anything resembling 'ozæna'; in particular there never was any fœtor, and several times there was no trace of secretion. Wherever fœtid pus or crusts were evacuated, a circumscribed focus could always be demonstrated, whether the origin were in open or in masked syphilis.

'Syphilitic ozæna,' too, just lately disinterred, is a symptom of local processes of suppuration and decomposition. It is, of course, quite possible that ordinary focal suppurations may discharge their secretions into a nasal cavity already widened by syphilitic atrophy of the turbinals, where they will find the conditions specially favourable to crust formation and decomposition (pp. 73 and 78). To draw conclusions from this as to the essential connection of syphilis with 'ozæna' is obviously absurd.

B. TUBERCULOSIS.

TUBERCULOSIS of the interior of the nose could only give rise to error under observation of the most superficial kind. In the primary form there is very little secretion; the type of infiltration, generally pronounced and tumour-like, is unmistakable; the situation in my own cases hitherto has always been characteristic, primarily on the very front of the floor of the nose and the cutaneous and cartilaginous septum.

The only point of contact between tuberculosis and syphilis of the nose consists in the fact that in both the walls of the accessory cavities may be destroyed by ulceration, and secondary mixed infection of the sinuses take place — post-tuberculous suppuration.

In two instances I observed such destruction of the mesial wall of the antrum under cover of the lower turbinal, and in both cases there was consequent purulent inflammation of the exposed mucous membrane without tuberculous disease of it.

Réthi⁽²⁷⁵⁾ recorded a similar case, but the infection spread from an alveolus.

Where nasal tuberculosis occurs as a metastasis of a general infection, the localization of the lesions may be just as aimless and irregular as in tertiary syphilis, and this localization may be readily distinguished from simple suppuration by the peculiarities of the process. Thus, tuberculous processes have also been observed in the accessory cavities.

In a female patient of Bardeleben's⁽¹²⁰⁾ with disease of the frontal sinus, the nature of the process was indicated by the history and the reaction to tuberculin; and there were also

multiple points of suppuration in the bone, and unhealthy granulations eroding its surface.

A similar observation by Frank and Kunz⁽²⁷⁶⁾ appears doubtful.

As far as I know, the above are the only cases recorded. What led Dmochowski⁽²⁷⁷⁾ to the erroneous assumption that Killian⁽²⁷⁸⁾ and Weichselbaum⁽²⁷⁹⁾ had observed tuberculosis of the antrum I cannot understand.

POSTSCRIPT.

DURING the publication of this edition a certain amount of delay took place, and during that time material came into my possession, in the shape of published cases and personal experience, when it was too late to incorporate it with the earlier chapters to which it properly belonged.

The most important items will be mentioned in this place.

I. Pathological Anatomy.—Ethmoidal Bone Disease.

Hicguet (²⁸⁰) reports three cases of ethmoidal empyema, in two of which caries of the lachrymal bone and orbital abscess occurred. Raoult (²⁸¹) records empyema of the anterior cells with necrosis of the bony wall of the nose (lamina papyracea?). Anrooy (²⁸²) describes, first, caries on the mesial surface of the middle turbinal and development of polypi, in empyema of the lower ethmoidal cells on both sides, and of the left antrum; second, empyema and caries of the middle (?) ethmoidal cells and the left sphenoidal sinus. Finally, Mayo Collier (²⁸³) reports the removal of a polypus, together with necrotic bone, apparently from a case of ethmoidal empyema. Anrooy's (²⁸²) description corresponds exactly with the results of my own examinations with the probe.

The Frontal Sinus.—Ramage (²⁸⁴) reports acute suppuration with fistula of the lower wall, and necrosis; Collier (²⁸⁵), a fistula leading downwards in a case of chronic empyema; and Silcock (²⁸⁶) three similar cases.

The Antrum.—I lately succeeded in diagnosing cyst formation inside a polypus of the antrum in a case of empyema, and

the diagnosis was confirmed at the operation; further, I find that with the help of after-inspection (p. 228), which I now always employ, it is possible, much more frequently than could have been supposed, to make out the existence of polypi of the mucous membrane in cases of empyema; in ten recently-opened cavities they were found at least four times. This method will yet, we may hope, yield us complete information regarding the pathology of the cavities during life.

Finally, in one case I was able to recognise the existence of a longitudinal bony partition in the cavity, and to remove it by operation. (I reserve for the present a detailed report of this interesting case.)

The fact of bone destruction occurring as a result of simple empyema of the antrum has been recently confirmed by Dmochowski's⁽²⁷⁷⁾ case. He also observed the development of polypi inside the cavity as a result of suppuration.

II. Intracranial Suppuration.

The following additional facts have been observed:

Panas⁽²⁸⁷⁾ records the case of a man, aged 31, who went blind of the right eye on April 13, 1894 (in the beginning of the month he had suffered from pain in the first upper molar on the right side). Simultaneously swelling of the right cheek and round the right eye came on, with fever and rigors. The eye was immovable, the lids heavy, disc pale, veins dilated. On April 17 pus was evacuated from the upper eyelid by incision; fœtid pus was discharged from the antrum. There was temporary improvement, and then a recurrence of high fever, pain in the neck and head, and vomiting. Death on May 15.

Post-mortem.—There was a hole as big as a lentil-seed in the lamina cribrosa on the right side; the dura was adherent over it; the frontal lobe had suppurated. Ethmoid and lesser wing of the sphenoid infiltrated with blackish pus. The antrum communicated with the orbit through a wide opening close to the foramen opticum. The optic nerve was compressed at this spot, and there was optic neuritis extending to the left chiasma and tract.

Westermayer (²⁸⁸) reports an empyema of the antrum, which was treated in the end of December, 1894, by the extraction of the right upper canine. In the end of April, 1895, he was seized with prostration, and pains in the limbs, neck, and back. Temperature, 103·5° F. After a few days there was paralysis of the pupil, subnormal temperature, somnolence, and death.

Post-mortem.—A fœtid abscess as big as a hen's egg in the right temporal lobe; basal meningitis on the cerebellum, and sinus meningitis. Adhesion of the right temporal lobe to the centre of the middle fossa. External to the foramen rotundum and ovale there is a hole in the bone as big as a threepenny-piece, full of granulations, and communicating with the antrum; thus, there has been rupture of the posterior wall of the antrum into the pterygo-palatine fossa and greater wing of the sphenoid.

If, in such a case as the above, the cavity had been freely opened and plugged when the rupture was beginning, how certainly would it have been said that fatal retention of pus immediately set in, and very probably the rupture would have been ascribed to the operation! The above report strongly supports my theory that in such unfortunate cases the rupture has generally already taken place, or is at least imminent.

As showing the necessity for great caution in judging of the cause of death without a post-mortem examination, I may mention, in addition to my own experience (p. 132) and Heryng's (¹⁷⁹), a case of Hellmann's (²⁶⁹), in which a female patient died forty-four days after an operation on the ethmoid; the post-mortem revealed capillary apoplexies of the brain.

It has often been insisted upon that latent brain disease must be much more frequent than is supposed, and this fact is illustrated by the following cases: Kayser (²⁸⁹) cut off a nasal meningocele, thinking he was operating on a polypus; and Dmochowski (²⁷⁷) diagnosed a case of cerebral abscess from empyema of the antrum and sphenoidal sinus as croupous pneumonia and plegmon of the face.

III. Secretion.

The 'ozæna' hydra has raised a new head. Strübing (²⁹⁰), following Löwenberg's example, caused bacteriological ex-

aminations of his material to be made by Abel; the same organism was always found. The only new idea is the theory that this bacterium by itself has nothing to do with the atrophy, but gives rise to a peculiar kind of crust-forming secretion. I have already pointed out (p. 74) that there is no reason to suppose that the action of bacteria in 'ozæna' can be other than saprophytic, however constantly they may be present, and Strübing does not offer a particle of proof that Abel's bacteria produce the secretion.

Even if he always (?) found 'characteristic' secretion present with these bacteria, that does not by any means prove that the secretion was caused by the bacteria; to a bacteriologist it would seem a much more probable explanation that only certain kinds of secretion provide a congenial soil for the growth of Abel's bacillus.

In any case the condition is not constant, for Strübing himself observed several cases of disease of the accessory cavities with 'retention and drying of secretion in the nose' in which the bacillus was not present.

If Strübing considers that cases of empyema in which Abel's bacillus is present are to be looked upon as due to the extension of a process primarily affecting the nose, he fails in his work to adduce any proof of such a process, and the same may be said of all previous authors who have advocated similar views. The relative rarity of empyemata in Strübing's experience (as in Réthi's) is suggestive.

And when he says that 'upon the whole, he has rarely had any difficulty in diagnosis,' this seems a remarkable statement to one who, like the author, has rarely failed to encounter difficulty in the diagnosis of those very 'ozæna' empyemata. No doubt Strübing's difficulties were diminished by the fact that 'bacteriological examination was' (to him) 'of decisive value in these very cases'; but it must be remarked that that is a proposition which ought to be proved before it is assumed. I think, too, that we shall have more numerous and more accurate observations if we do not attach importance *a priori* to more secondary conditions, the value of which must often be questionable. For instance, according to Strübing, the unilateral appearance of dried masses of secretion is in favour

a priori of the existence of empyemata; 'the bilateral suppurations, mostly syphilitic, are very rare.'

Now, according to my experience, bilateral suppuration is by no means rare, nor is it generally syphilitic; for not less than 42 per cent. of my non-syphilitic suppurative cases were bilateral. Thus, the negative value of Strübing's testimony is extremely questionable. I cannot find in his work a single new proof of the existence of 'ozæna' as a disease, nor any novel explanation of the symptoms.

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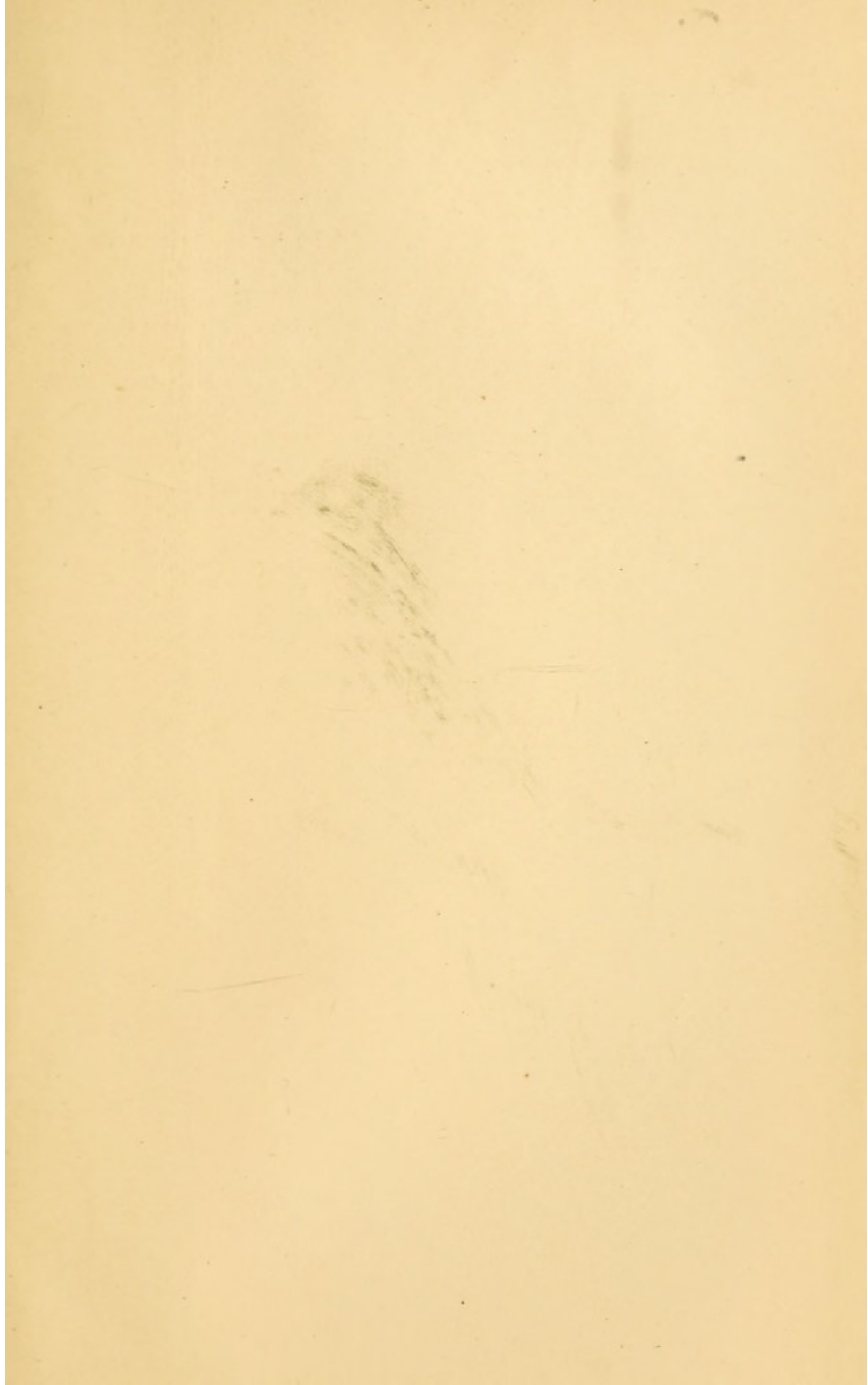
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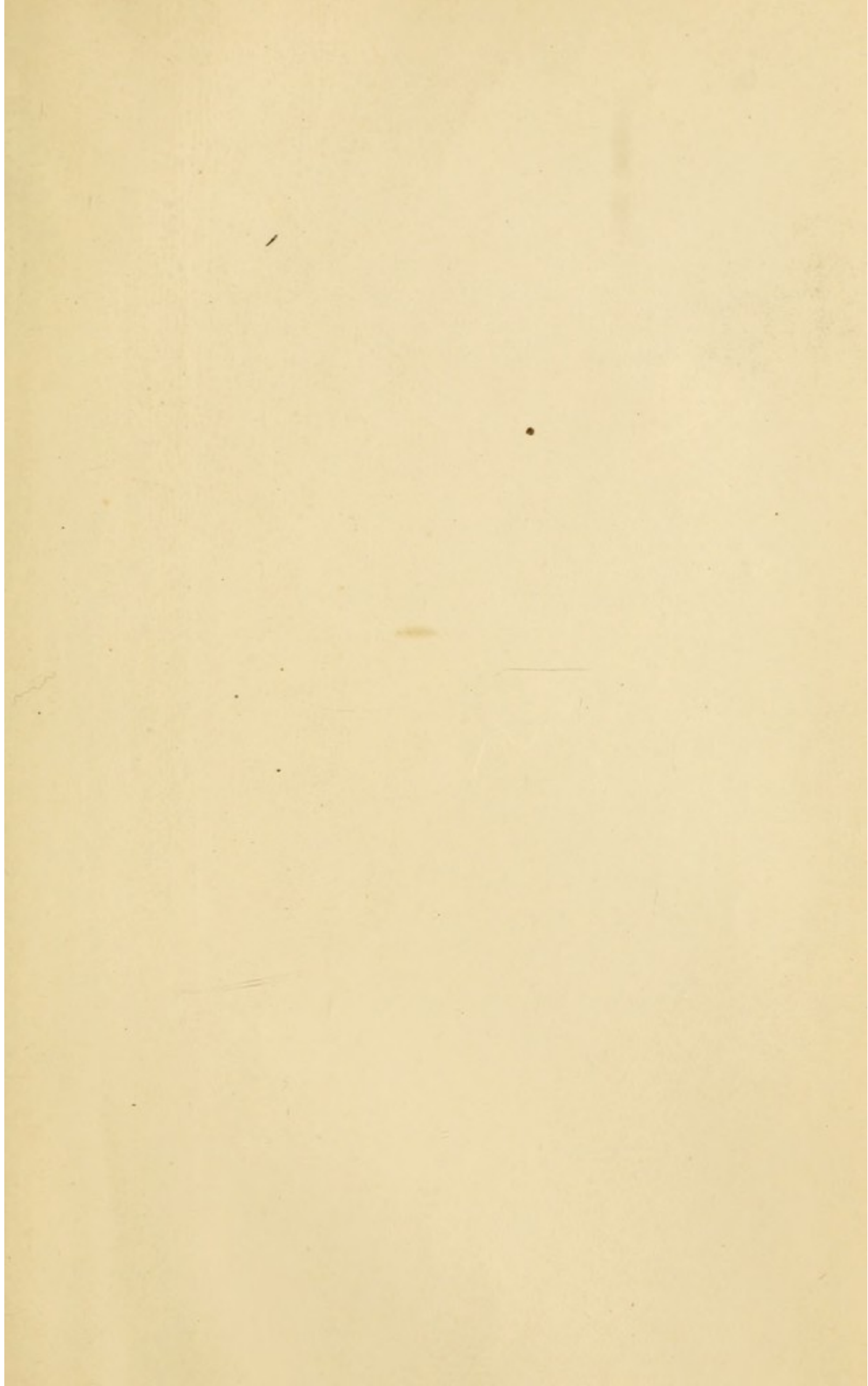
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